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# BLUE JAY

September 1979

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# AN INSECT PEST OF SASKATOONS

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University of Saskatchewan, Saskatoon.

Most residents of Saskatchewan are familiar with the saskatoon, *Amelanchier alnifolia* Nutt. The range of this plant, however, encompasses a much larger area of North America (Fig. 1) making it the most widespread member of the genus *Amelanchier*. It is characteristically found in coulees, bluffs, creekbeds, or open woodlands throughout its range and is known by such local names as Juneberry, Serviceberry, Shadbush or Petites Poires.[1] In this province the berries are well known for their sweet, distinctive flavour and excellent freezing and canning qualities which make them one of our most sought after natural crops. Cultivated varieties such as 'Smokey' or 'Pembina' are available but cultivation is not extensive and most people rely on natural crops, when available.[2] The plant has excellent potential as a fruit crop for the prairie region and attempts are currently underway to develop it in this respect.

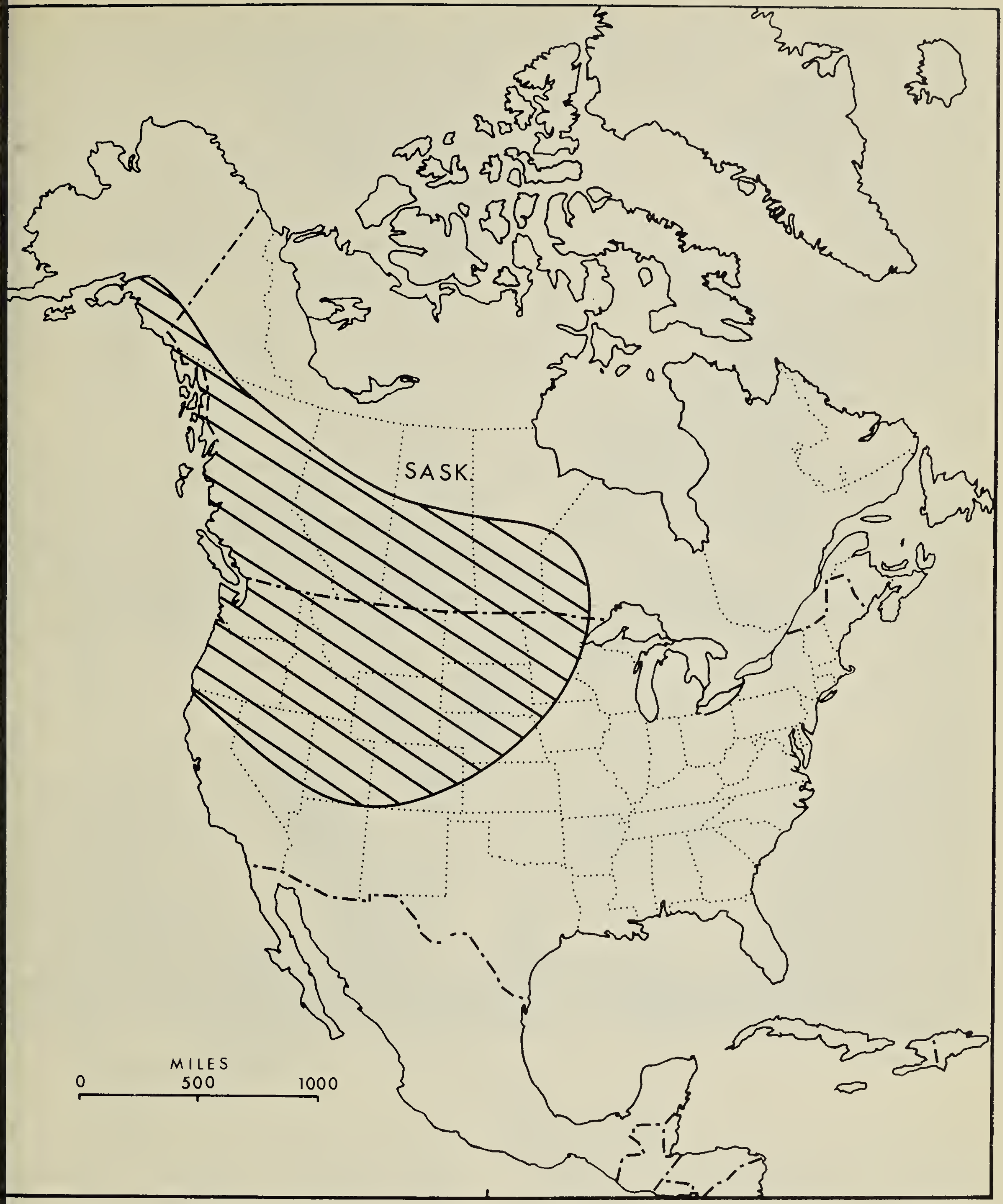
It is well known that although wild saskatoons can produce heavy crops of fruit, production tends to be very unreliable and heavy crop years in a given locality are often interspersed by several seasons in which little or no fruit of any quantity or quality can be found. A number of reasons including such factors as late spring frost, spring drought or high winds during blossoming are often put forth by local residents to explain this variability. No single explanation, however, appears to be conclusive and although any one of a combination of these factors may contribute to crop failures, observations we have carried out over a five-yea period at one location eliminated all o these climatic factors as the fundamental cause of crop failures Indeed, complete crop failures were recorded in seasons in which al weather conditions seemed to be entirely favourable for good berry production. This was most perplexing and a detailed investigation was undertaken to try and find a more plausible explanation for the variability observed in fruit production.

### The Survey

To try and determine whether variations in crop production are a localized phenomenon or whether they extend over wide areas of the province, a survey was carried out in which selected members of Saskatchewan Natural History Society were contacted in the winter of 1976-77 and asked to rate the saskatoon crop in their area as good, fair or poor for the 1975 and 1976 crop years. The results of this survey showed that variability in saskatoon production indeed tends to be very localized and that it follows no pattern over broad areas. Wide fluctuations were noted in adjacent areas (Fig. 2), strongly suggesting that climatic factors are not the sole cause of the crop failures.

### Phenology

Phenological studies of fruiting saskatoon branches were undertaken in the spring of 1976 and 1977. Individual branches at a rural site approximately 35 miles from Saskatoon (S.W. 31-31-6) on the



igure 1. *Range of the saskatoon,* Amelanchier alnifolia *Nutt., in North America.*

anks of the South Saskatchewan iver were tagged and the progress of erry development documented. hese data are summarized in Table . It can be seen that fruit set express-d as a percentage of blossoms riginally present was high, in both ears, indicating that successful ollination had occurred. As the fruits were approaching their mature size, the counts were repeated and at this time, in all cases, a dramatic drop in fruit number had occurred. A further drop in number was recorded when the ripe fruits were harvested at the end of the season. When these harvested fruits were brought into the laboratory for detailed examination, it

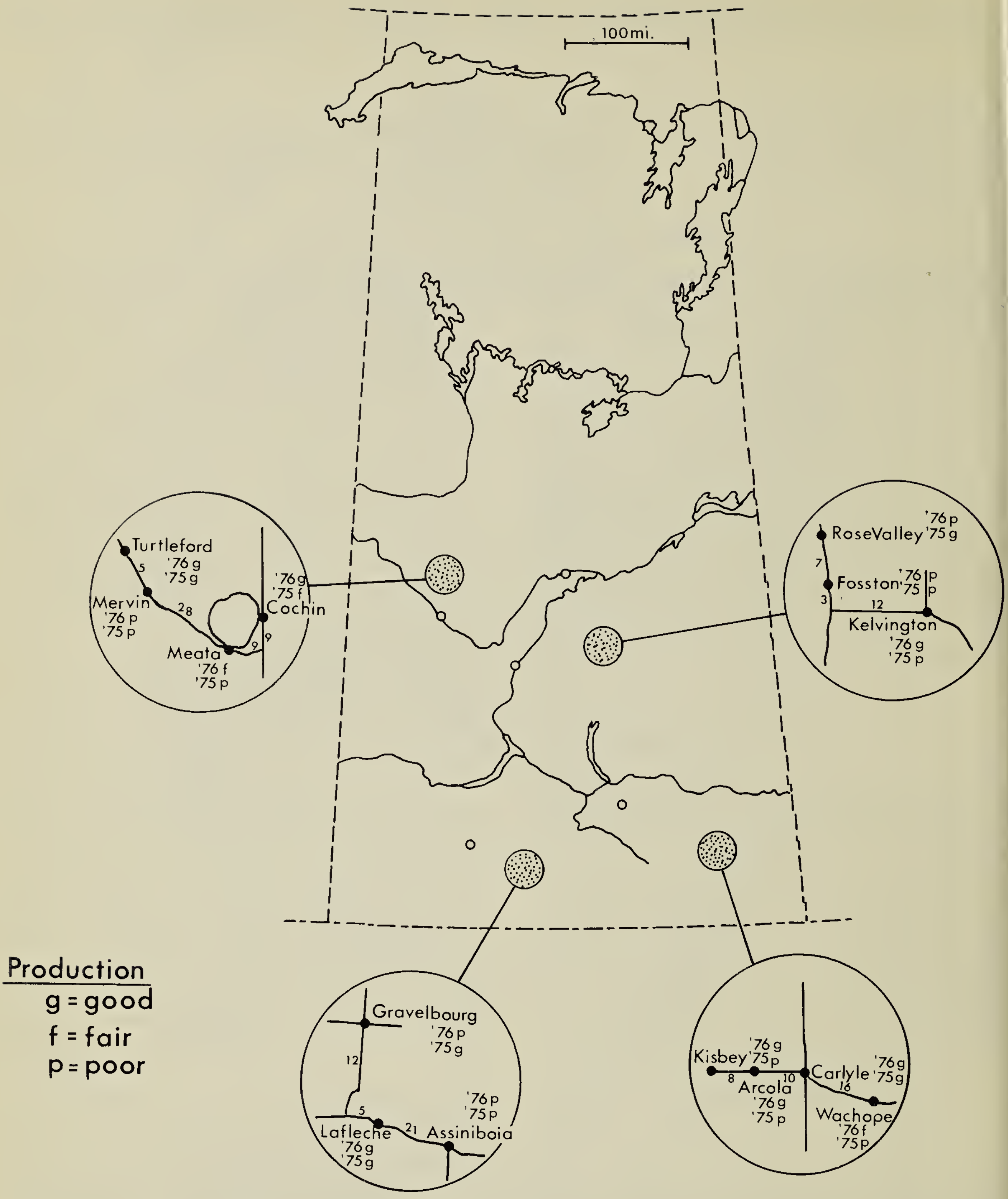
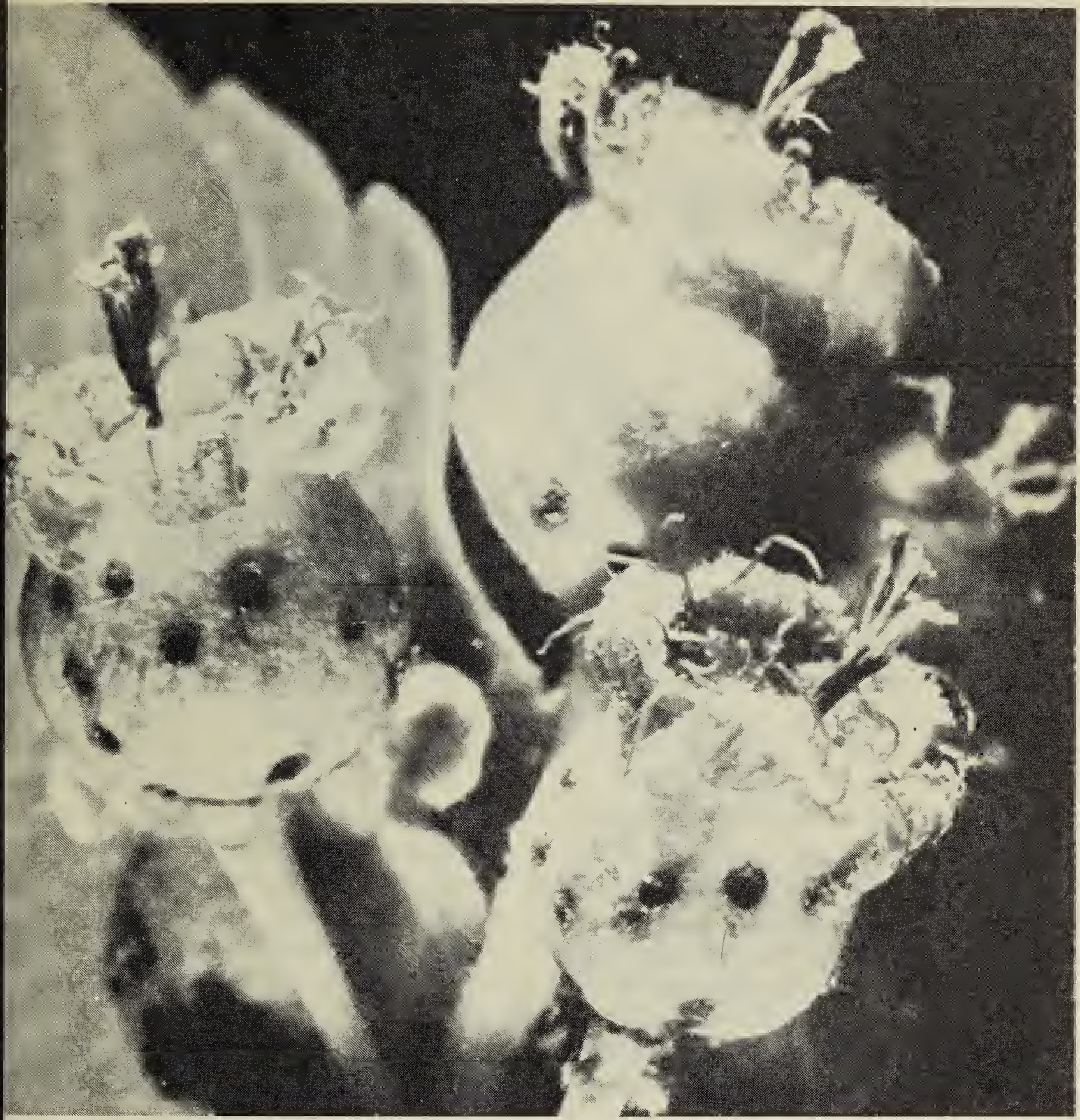


*Figure 2. Four examples of saskatoon crop fluctuations in Saskatchewan, 1975 and 1976.*

quickly became evident that an even lower percentage of the fruits could be considered at all desirable or useable. Most of the berries were heavily damaged, apparently by insects; the most common type of wound being a deep puncture (Fig. 3). Dissections of harvested fruits also revealed larvae and pupal stages in many berries indicating the active involvement of an insect in damage to developing fruits.

## The Insect

The punctures noted on damaged berries were indicative of an insect of the weevil type. Collections were made on and about clumps of saskatoons and beetles of this type were found. Specimens collected



*igure 3. Curculio punctures to saskatoon berries.*

ere sent to the Biosystematics esearch Institute in Ottawa where ey were identified as *Tachypterellus* *uadrigibbus* Say, the apple curculio Fig. 4). This insect resembles the well nown rose curculio but is approx-ately one-half the size. The species s widely distributed in North America nd has been described as a pest in rchards of apples, plums, cherries, eaches etc. References were found its presence on *Amelanchier* but no ndication of damage was provided.[3] [4]

Since populations of the curculio at e rural site seemed small and inadequate to account for the extensive puncture damage observed, curculios were brought into the laboratory for controlled feeding experiments. Single beetles were placed in vials, each with one freshly collected fruit and the fruit was scored for feeding punctures. An average of 11.1 punctures per berry over a 40 hr period indicated that a single curculio is capable of inflicting severe injury and that a large and conspicuous population would not be necessary to account for the heavy damage observed to berries in the field. Moreover, since

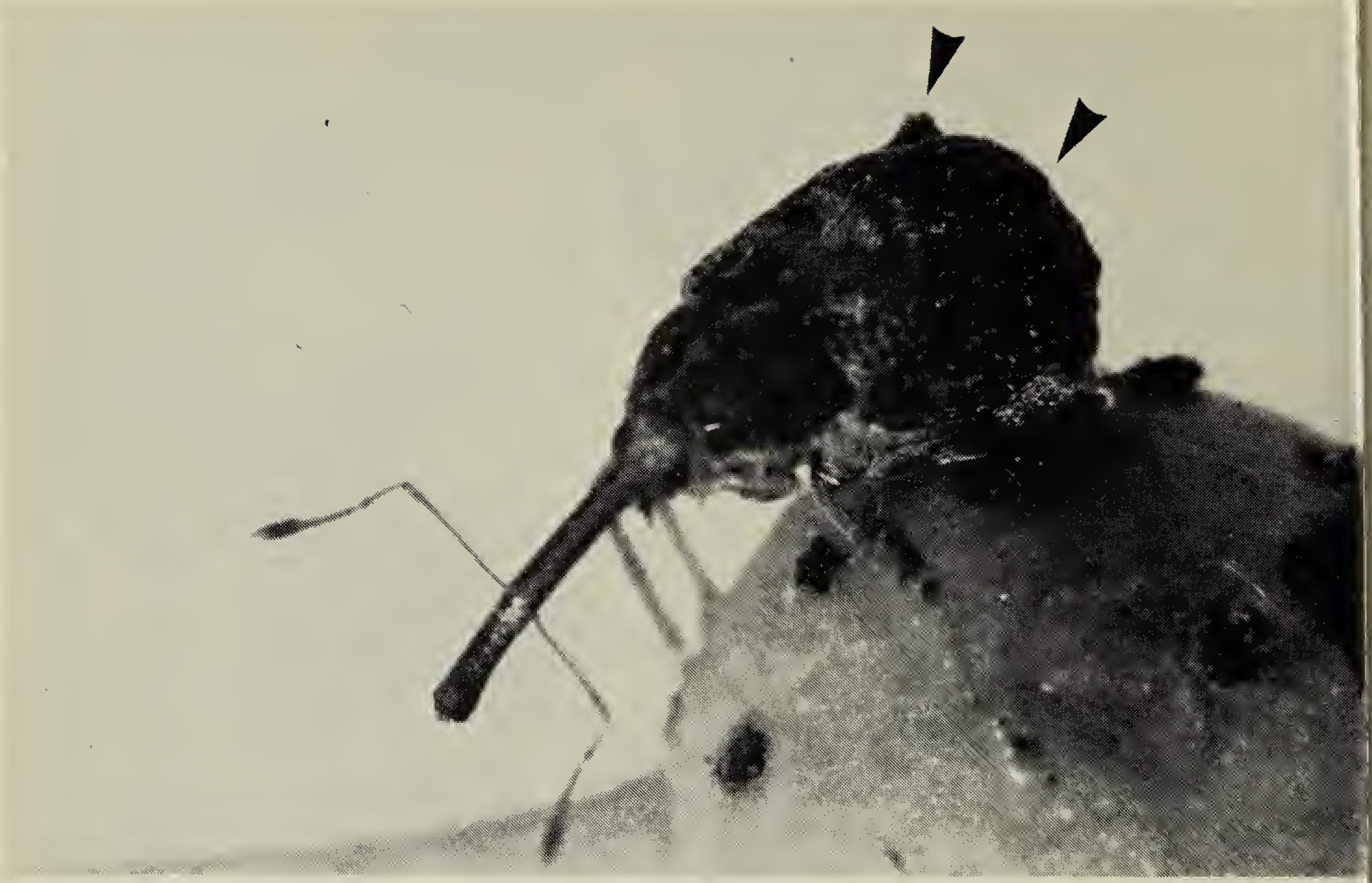


*Figure 4. The apple curculio,* Tachypterellus quadrigibbus *Say, (note characteristic bumps on elytra.)*

punctures observed in this experiment were identical to those found in nature, it is reasonable to conclude that the apple curculio collected on and around fruiting saskatoon bushes is responsible for the extensive damage observed to developing fruits, many of which drop as a result.

### Fruit Protection

In 1976, six fruit-bearing branches were protected at the rural site on 24 May when the fruit was developing but already showed signs of curculio damage. The fully ripe fruit was harvested on 8 July. Many shrivelled, dropped fruits as well as retained damaged fruits were found, but the proportion of large, unpunctured berries (18.6%) was still substantially higher than that found on unprotected branches (0.3%). A similar experiment was carried out in 1977 when two branches were covered on each of four occasions: 13, 23, 28 May, and 3 June. For one of the two branches protected on each occasion a record of fruit set had been made in mid-May, just after pollination. The fruits were harvested and examined when fully ripe in early July. The results confirmed the findings of the previous season, but indicated a progressive decline in the proportion of unpunctured fruits with increased exposure prior to bagging.[6] Since counts had been made of the original number of fruit set, it was also possible to determine the effects of protection on berry retention, as well as quality. It was found that bagging even as late as 3 June markedly reduced fruit drop (59% retained as opposed to 39% on the controls) and that earlier protection resulted in retentions as high as 90%.[6]

In 1978, our study was expanded to include an urban site on an acreage just south of the city. Fruit set was recorded on marked branches at both sites shortly after pollination. Some branches were left untouched as controls, while others were bagged on successive dates for five weeks at

TABLE 1. Flowering and fruit set of the saskatoon, rural site, 1976 and 1977.

| Year | No. branches | No. flowers | Immature* fruit | Maturing** fruit | Mature** fruit | Desirable** fruit |
|---|---|---|---|---|---|---|
| 1976 | 20 | 2437 | 2125 (87.2) | 781 (36.8) | 676 (31.8) | 2(0.09) |
| 1977 | 9 | 1186 | 731 (61.6) | 464 (63.5) | 456 (62.4) | 24 (3.3) |

* %'s (in brackets) compared to the original flower number

**%'s (in brackets) compared to the number of immature fruit set

both sites. All observations were terminated and fruit collected during the first week in July. Collected fruit was brought back to the laboratory for detailed examination.

Damage at the rural site was extremely severe, even early in the season when the original counts of immature fruit set were made. Despite the fact that branches were protected by bagging, little positive effect on berry retention was noted. The effect of bagging on berry quality, however, was more conclusive. The only perfect berries found in the field at the rural site were those on branches protected from the curculios. A progressive decline in berry quality with increased exposure prior to bagging was evident.

Damage at the urban site was not nearly so severe, perhaps reflecting the variations observed in the berry crop throughout the province. Trends noted in earlier phenological work were clearly evident at the urban site. Retentions were higher on branches bagged earlier than on those protected later and berry quality decreased with increased exposure prior to bagging. The unprotected control branch had only 16.2% unpunctured berries at harvest, compared to 63.0% on the branch bagged 24 May. This decline in berry quality with increased exposure to the curculios is shown in Figure 5.

## Discussion

Despite the overall popularity of the saskatoon, no serious investigations have ever been carried out to provide an explanation for the frequent and characteristic crop failures in this area. Considering the potential of the saskatoon as an economic crop for the prairie region, an explanation for these crop failures is essential.

It is clear from evidence presented in this report that the feeding and reproductive activity of the apple curculio has a pronounced effect on both retention and quality of fruit produced by saskatoons at the sites investigated. Although other factors cannot be entirely eliminated, we feel that the activity of this beetle is the major cause of the crop failures observed. Extensive feeding damage to blossoms and young berries causes them to drop and therefore substantially decreases retentions. Feeding damage later in the season when the berries are larger and more mature apparently does not cause actual fruit loss, but substantially reduces the quality of the fruit retained. Fruit quality is also affected by egg-laying and subsequent development of larval and pupal stages within the berries. It appears that those fruits in which eggs are laid remain attached until the adult emerges.

It is evident from the survey results

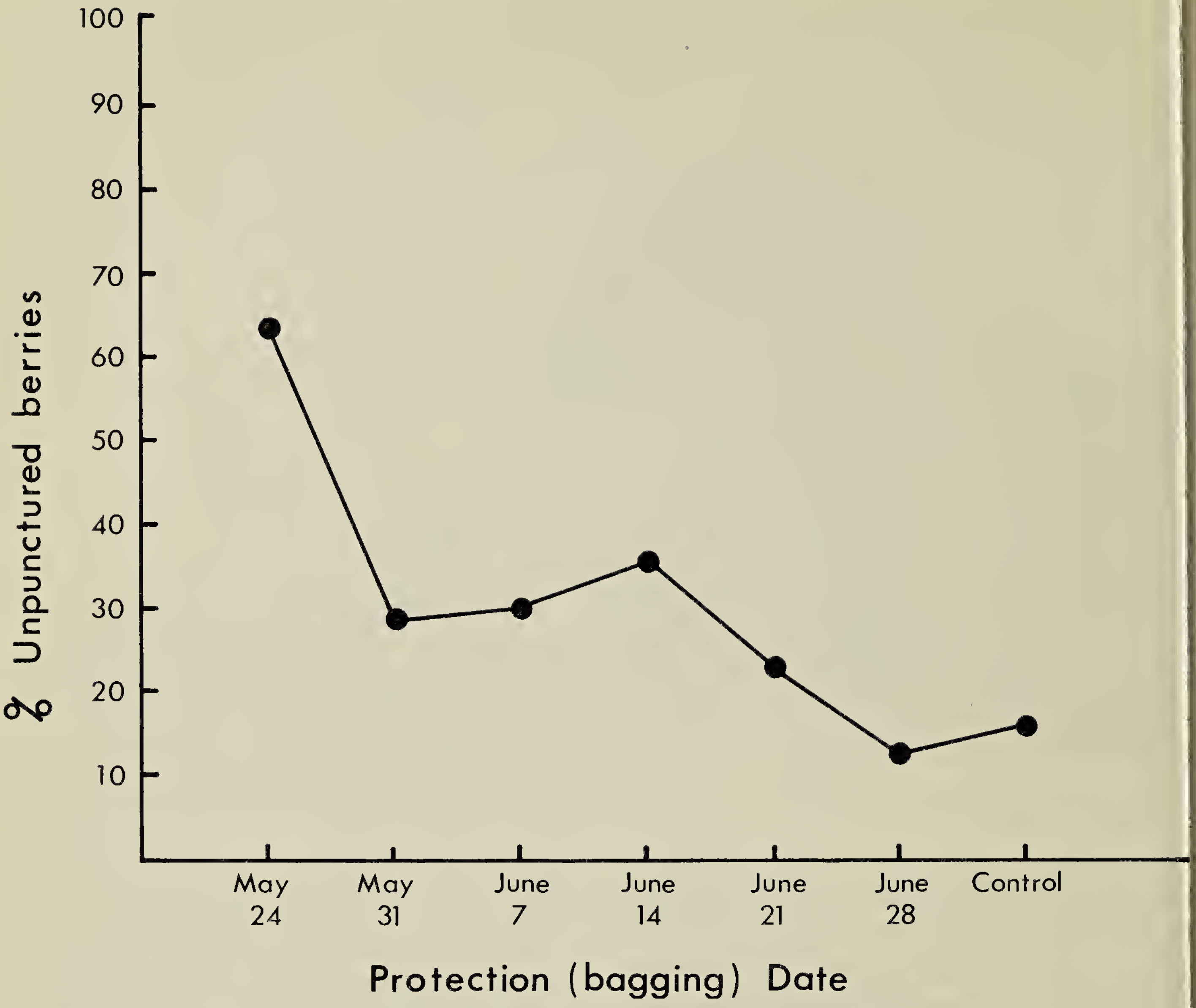


*Figure 5. The effect of protection date on berry quality, urban site, 1978.*

that there is a pronounced local variation in severity of damage to the fruit. Several factors can influence this. Of prime importance must be the population level of the curculio. In those areas in which a high population has developed, one would then expect a corresponding increase in extent and severity of damage. Extension of our present study to include several other localities in the province is necessary to expand upon this idea. Published reports indicate particular habits of the apple curculio that could also influence the local variations in crop production observed.[3 5] Although capable of strong flight, the beetles do not migrate extensively in any one season. It would thus be expected that local conditions influencing either the population size or the activity of the apple curculio could result in substantial differences in the extent and severity of damage inflicted.

Temperature also appears to play an important role. List has reported that at temperatures below 55°F (13°C) the activity of the insects is depressed.[3] Cool, rainy weather in the early stages of berry development could result in decreased curculio activity and thus reduce the damage potential. It is difficult, however, to visualize this single weather condition as the sole source of the highly localized variations in crop development and insect activity and further work is required to determine what other factors may be involved.

It is often difficult to find curculios in natural stands of saskatoons unless extensive attempts at collection are made even though damage is evident from close examination of the fruit. This may be related to their habit, when disturbed, of feigning death and dropping to the ground. Their colouration also helps to make them ndistinguishable since they blend in well with bud scales and twigs. These characteristics, coupled with the fact that few people actually examine fruiting stands of the saskatoon until picking time may account for the fact that the beetle and its activities have gone unnoticed for so long. The fact does remain, however, that the apple curculio does indeed have an important role to play in influencing retention and quality of fruit produced by the saskatoon. Further information to clarify some of the outstanding problems remaining is necessary and t is hoped that expansion of our present investigation will shed still more light on the matter. We would welcome any information concerning this problem and take this opportunity to express our gratitude to those who responded to our initial survey. Reprints of our article to be published in the Canadian Entomologist or of this article will be available on request.

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*Tailed Blue* *C.R. Wershler*

# THE ROCK WREN IN SASKATCHEWAN: STATUS AND DISTRIBUTION

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Those who have spent time in the dry river valleys and badlands of the southwest will likely have made contact with the Rock Wren, a bird of drab plumage and mouse-like habits made conspicuous by its fine, far-carrying song. Although it is locally one of the more common summer residents of rock outcroppings and river breaks in southwestern Saskatchewan, surprisingly little has been written concerning its distribution and status in the province. Laurence Potter, one of the province's earliest resident naturalists who lived near Eastend from 1901 to 1943, only once mentioned Rock Wrens in 29 short papers which he wrote on the status of birds in southwestern Saskatchewan.[17] W. E. Godfrey's later work in the Cypress Hills centered on the forested uplands and on the north slope where there is little suitable Rock Wren habitat and, therefore, added little additional information.[9] A nesting locality along the South Saskatchewan River has been briefly documented by J. F. Roy[19], and a possible breeding record for Regina is given by Margaret Belcher.[1] Information on the status of the Rock Wren in southeastern Saskatchewan will be provided in the forthcoming "Birds of the Qu'Appelle Valley" by E. M. Callin.

Most of the records included here are unpublished. Table 1 and Figure 1 summarize all records, together with the observers and sources, known to me through 1978. For the sake of brevity, further referencing o observers and sources, especially fo unpublished records, has been kep to a minimum.

## Historical Records

Evidently, the earliest record of the Rock Wren within the present boundaries of Saskatchewan was one observed at the "east end of the Cypress Hills" on 26 June 1894 by John Macoun who was employed by the Geological Survey of Canada.[1 The following year the first specimen was collected by William Spreadborough along "Rocky" [Rock] Creek, southwest of Killdeer.[14]

The next reference was in 1917 when H. H. Mitchell collected specimens in the "Cypress Hills" for the National Museum of Canada (D. M. Richardson, pers. comm.); in 1921, P. A. Taverner and H. Laing collected additional specimens at Eastend.[9] Mitchell recorded the first definite evidence of breeding, a nest with 8 eggs, in the "Cypress Hills" on 1 June 1925.[3]

The earliest summary of the Rock Wren's status and distribution in Saskatchewan was in 1924: "Not common; noted, and found breeding, only in extreme southwest from Cypress Hills to Wood Mountain districts, in outcropping sandstone."[16]

## Spring Arrival

The earliest spring arrival date for

Saskatchewan is 21 April (1978) near Eastend. There are only two other April records: 26 April (1932) and 28 April (1962), both at Regina. The earliest spring arrival dates at known breeding areas with several years of systematic observations were 1 May at Eastend (M. Gollop) [L. Potter's earliest record was 3 May], 5 May at Val Marie (J. D. Chandler), and 6 May at Matador I.B.P. Grassland.[15] In most years, Rock Wrens are probably rare before the first week of May. No spring concentrations have been recorded.

## Nesting

Rock Wrens are evidently well-established on territories by the 3rd week of May. There are only three records of nests with eggs: 1 June 1925 in the Cypress Hills (8 fresh eggs),[3] 20 June 1959 in the Big Muddy Valley (2 eggs), and 20 June 1971 at the mouth of Swift Current Creek (5 eggs). An observation of a pair nest-building at Boundary Plateau on 25 June (1978) indicates that eggs may be expected as late as July. Nestlings have been observed as early as 20 June at Skull Creek, and as late as 13 July at Matador I.B.P. Grassland.[15] Fledged young in family groups have been observed from 8 July at Old Man On His Back Plateau to 18 August at Ravenscrag.[9] [8]

Most breeding records consist of observations of adults carrying food into crevices or holes. A nest in the Big Muddy Valley was located under a "small, flat rock" on top of a rocky hill (R. Carson, PNRS); another located along the South Saskatchewan River was "in a crevice in a vertical cliff . . . 30 feet [9m] from the top of the cliff" (W. Harris, PNRS). At Muddy Lake, near Unity, adults were feeding nestlings at a small hole (evidently created by running water) 2.5 m from the bottom of a steep slope of eroded sandstone (pers. obs.).

The meagre information on nesting chronology suggested that most nests are built in late May and eggs are present from at least the last week of May to the 3rd week of June (and probably into July); nestlings appear from the 3rd week of June to the 2nd week of July. Thereafter, until at least the 3rd week of August, family groups may occur throughout the breeding range.

## Fall Migration

The latest fall record for Saskatchewan is 27 September (1927) in the Big Muddy Valley. Potter's latest observation in prime breeding habitat at Eastend was 15 September (1921). Fourteen Saskatchewan records for September suggest that Rock Wrens regularly remain long past the breeding season, even in areas north and east of the regular breeding range (e.g., Arm River Valley, Broadview, Buffalo Pound Lake, Floral, Pasqua Lake, Regina). No fall concentrations have been recorded.

## Distribution and Abundance

The breeding range of the Rock Wren consists of several pockets and corridors in the grasslands and parklands of the south and southwest. Figure 2 summarizes the breeding distribution based on records in Table 1 and Figure 1.

No plot studies of breeding bird densities have been done in Rock Wren habitat; hence, there is no quantitative information on absolute numbers. However, the available information indicates that densities vary considerably within the species' known range in the province.

One of the largest breeding populations inhabits the upper Frenchman River and associated coulees on the south slope of the Cypress Hills: "At Jones Peak alone

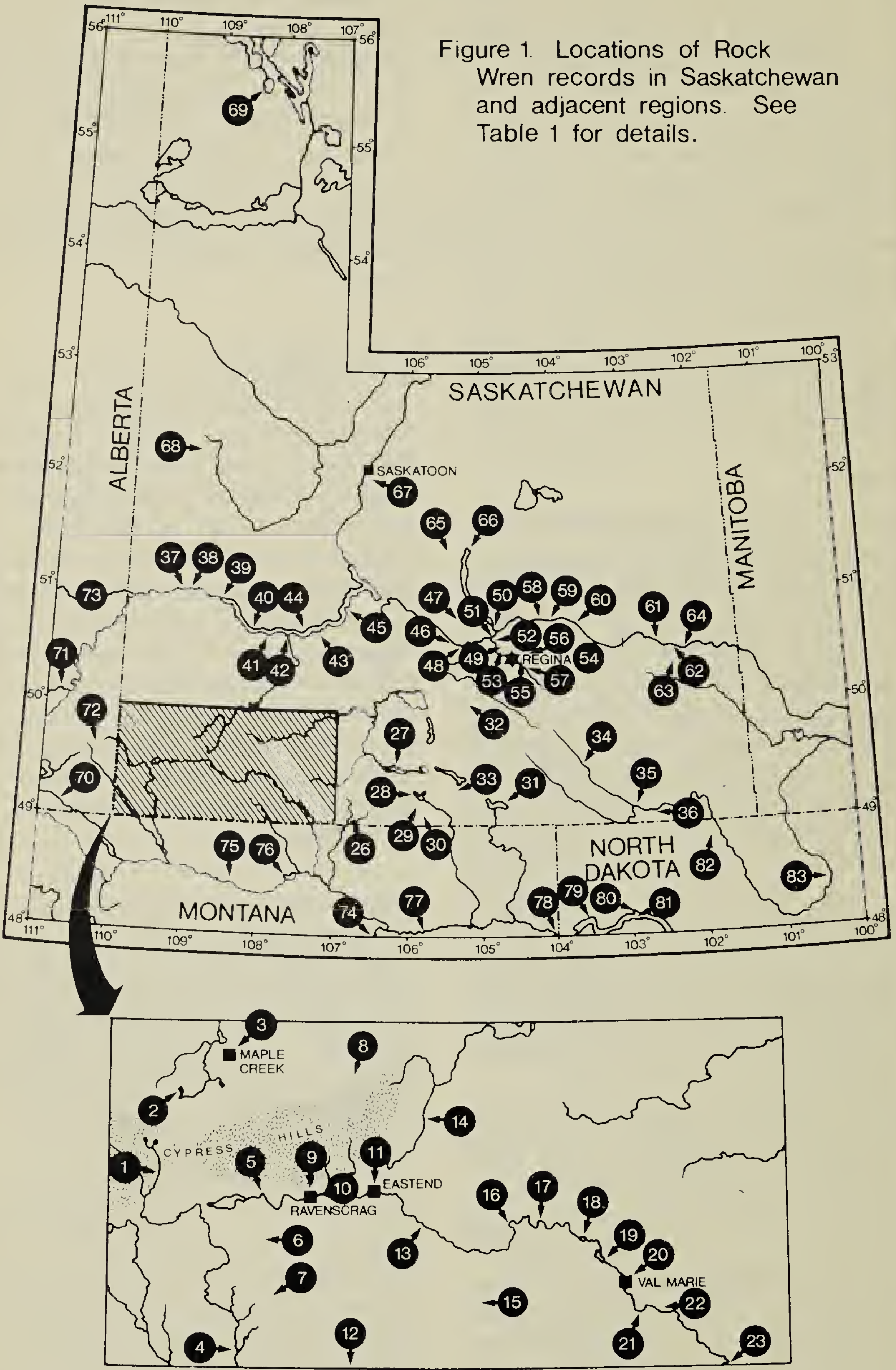


Figure 1. Locations of Rock Wren records in Saskatchewan and adjacent regions. See Table 1 for details.

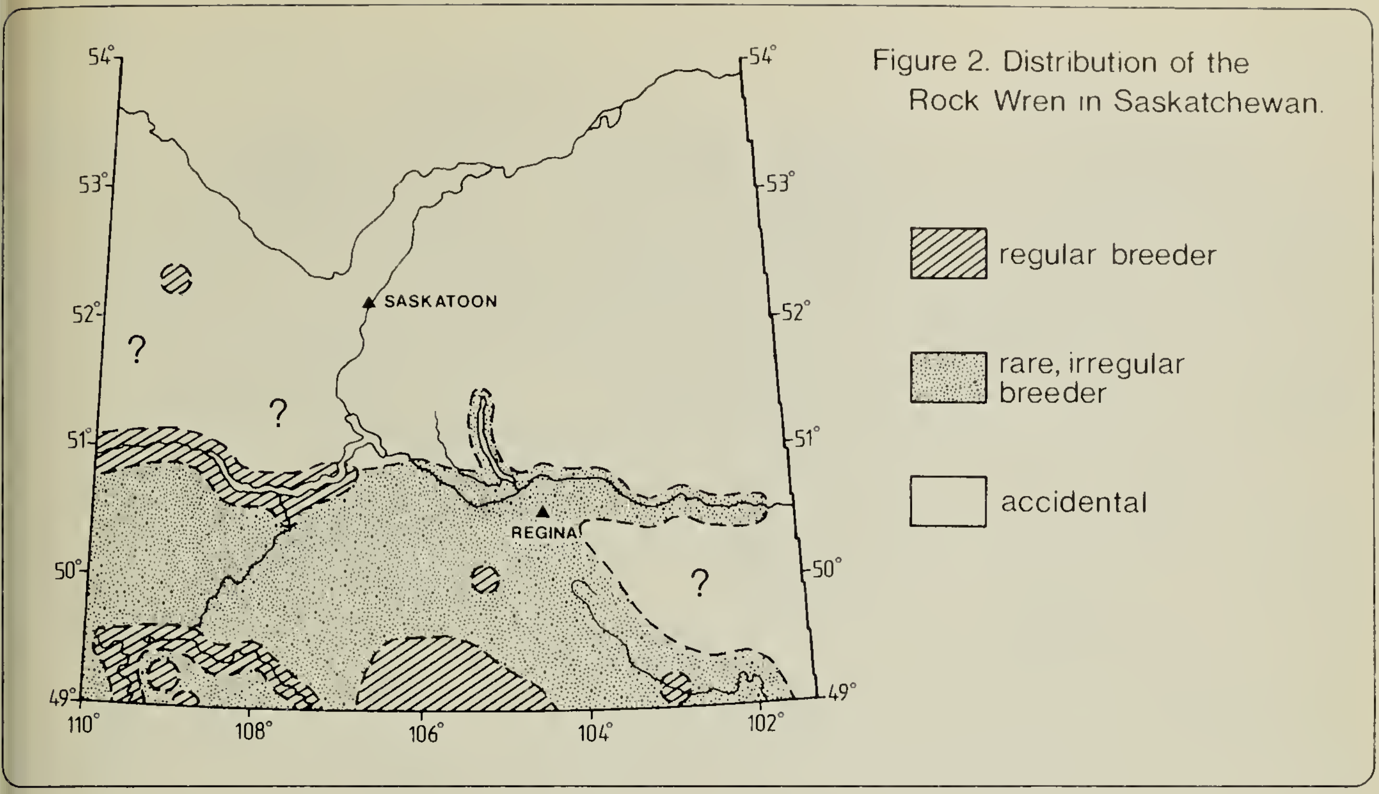


Figure 2. Distribution of the Rock Wren in Saskatchewan.

there were 5 to 8 pairs last summer (1977) and Jones Peak represents merely one of dozens of abutments along the river between the towns [of Eastend and Ravenscrag]. Though less common along the Conglomerate Creek system (including Concrete Coulee), they could still be described as common there with wrens using every suitable piece of ground" (M. A. Gollop, pers. comm.).

Rock Wrens are more locally distributed along the Frenchman River upstream from Ravenscrag and downstream from Eastend to the Montana border, along several tributary streams of the Frenchman River and Battle Creek, on upper Swift Current Creek northwest of Dollard, and in rock outcroppings between the Frenchman River and the Montana border (e.g., Boundary Plateau, Old Man On His Back Plateau). In the more heavily forested areas of the hills and along the north-facing slope, the Rock Wren is much less common. There are few records for the west block in Saskatchewan; however, at Elkwater Lake at the west end of the escarpment in Alberta, M. Y. Williams found the species common in 1926.[26] S. A. Mann, who farmed at Skull Creek on the north slope of the hills only 45 km from Eastend, recorded Rock Wrens only 4 times (once breeding) during about 40 years of observation.

Further north, the Rock Wren occurs in largest numbers along the South Saskatchewan River from the mouth of Swift Current Creek east to at least Sunken Hill southwest of Beechy (J. F. Roy and M. A. Gollop, pers. comm.). Along other sections of the river from Riverhurst to the Alberta border, the species is an uncommon summer resident.[19] These populations are apparently contiguous with populations in Alberta along the South Saskatchewan and Red Deer rivers.[20] Rock Wrens inhabiting lower Swift Current Creek are separated from populations on the upper creek in the Cypress Hills by about 150 km of unsuitable nesting habitat.

In the Wood Mountain-Big Muddy Valley area, large numbers of Rock Wrens occur in the Killdeer badlands between Rock and Morgan creeks. The species is more thinly distributed

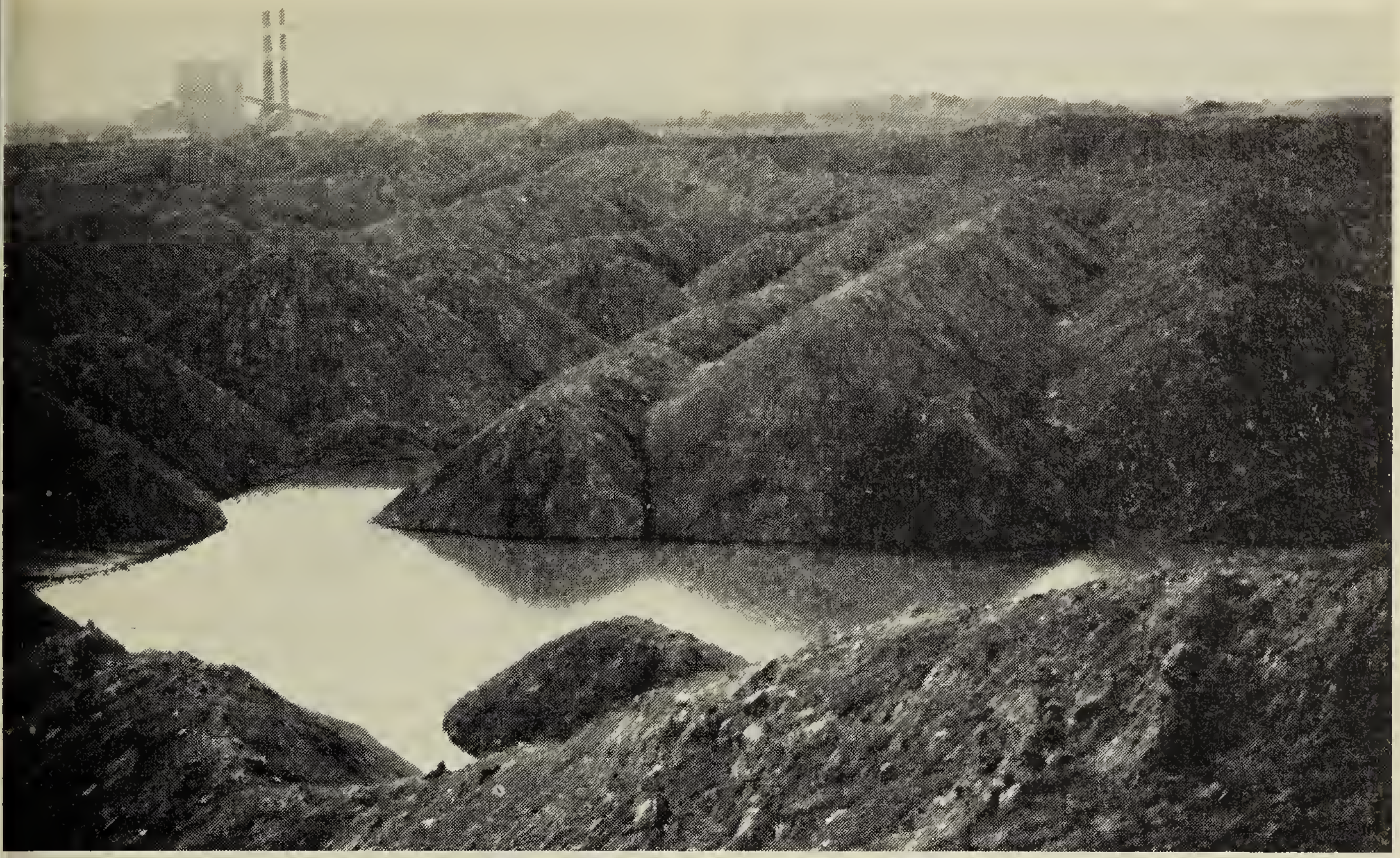
*Muddy Lake hills near Unity, northern-most badlands in Saskatchewan and mos northerly breeding locality of the Rock Wren.* *Wayne Renaud*

along the eroded valley walls near Fife, Twelve-mile, Willow Bunch and Big Muddy lakes, and along Goose Creek near Rockglen. It breeds in at least small numbers locally north to the Avonlea badlands.

Along the Souris River drainage in Saskatchewan, and into North Dakota, the species is even more locally distributed.[25] The largest numbers apparently occur in the Estevan spoil piles.

In the Qu'Appelle River drainage, the Rock Wren is a rare and irregular transient and summer resident; it was recorded in only 17 of 46 years from 1932 (first record) to 1978. About one third of the records were for 1959, suggesting that a northward eruption had occurred.[7] Assumed breeding at Pilot Butte near Regina and in the Qu'Appelle River Valley is based on circumstantial evidence since no nests have been found.[1] [7] There are no records for the extreme east end of the Qu'Appelle Valley in Saskatchewan or for southwestern Manitoba.

The only other breeding locality is in a restricted area of badlands west of Muddy Lake (near Unity), about 110 km north of the nearest breeding areas on the South Saskatchewan River. Probably fewer than 10 pairs nest annually in this area (pers. obs.). Except at Muddy Lake near Unity and the north end of Last Mountain Lake, the species can probably be regarded as accidental north of 51°N. The most northerly record was a Kazan Lake (55°35'N.Lat.) well within the boundaries of the mixed wood forest. The occurrence of the Rock Wren at much more northerly latitudes at Churchill,



*Spoil piles left after the strip-mining of coal in the Estevan area. The barren slopes with scattered fragments of shale provide habitat for the most easterly populations of nesting Rock Wrens in Canada.* *Bob C. Godwin*

Manitoba (as an accidental breeder)[11], and at Fort Chipewyan, Alberta, on Lake Athabasca[2], suggests that the species is an erratic wanderer and can be expected to occur, and possibly even breed, anywhere within Saskatchewan.

## Habitat

Throughout the greater part of its range in Saskatchewan, the Rock Wren is confined to eroded rock outcroppings (i.e., badlands) and the sparsely-vegetated walls of river valleys. The important requisites appear to be a barren substrate over which the birds can forage, and crevices where nests can be built. The large numbers along the Frenchman River occur in exposures of sedimentary bedrock. Eroded outcroppings in the Killdeer badlands, at Boundary Plateau, at the west end of Old Man On His Back Plateau, near Avonlea, in the Wood Mountain-Big Muddy Valley area, and near Muddy Lake support regular breeding populations. Most, if not all, bedrock outcroppings on the prairies and parklands appear to support at least small numbers of nesting Rock Wrens. Along lower Swift Current Creek and the South Saskatchewan River from the Alberta border to Riverhurst, the species is much less common; the small numbers may be attributable both to the peripheral position of these areas relative to the main breeding range, as well as to habitat that is less suitable for Rock Wrens.

In the past century, the species has expanded its breeding range to include several man-made habitats. The most significant of these is along the Souris River near Estevan, where large numbers now nest in the spoil piles left following coal mining activities. R. C. Godwin (pers. comm.) described these man-made habitats: "Rock Wrens are found in only certain areas of the coal spoils at Estevan, their presence or absence being determined by the geology of the area and, most importantly, by the mining technique used to expose the coal. In the late 1880's coal was dug directly from coal seams exposed along the eroded sides of the Souris River. Strip mining with tractor-drawn scrapers in the 1930's created a slightly rolling topography. As the supporting technology improved, steam and electric shovels and low capacity draglines were used, thus creating ridges 4 to 7 m high. More recently, high capacity draglines have created ridges up to 12 m in height."

"With the new equipment allowing the mining of progressively deeper coal seams in the Ravenscrag formation, the spoil piles contain a greater amount of poorly consolidated quartz sands, clays, silts and friable shales. Due to moderate salinity, high sodium, low amounts of nitrogen and phosphorus, and the water-impermeable crusting of the soil created by high sodium content, these new soils are slow to be colonized by plants. This combination of factors results in steep, hard banks with little vegetation, and numerous rock crevices; ideal foraging and nesting habitat for Rock Wrens."

Elsewhere in Saskatchewan, Rock Wrens have been recorded in numerous man-altered environments Within, and north of, the regular breeding range, Rock Wrens are often reported singing, and presumably nesting, in gravel pits (e.g., Eastend, Imperial, Pilot Butte and in road cuts (e.g., Valeport). On reservoirs, dams and causeways, the rock or concrete fill (rip-rap) placed on steep slopes to prevent water erosion is sometimes used as foraging and nesting habitat. Rock Wrens have been recorded in rip-rap at the Riverhurst Ferry (probably nesting), at Harris Reservoir and at Wascana Lake. In Montana, some slopes of rip-rap (e.g., Fort Peck Dam) support considerable nesting populations (C. M. Carlson, pers. comm.). Rock Wrens have also been seen foraging in woodpiles, on stone fences, on piles of cement blocks, and in culverts. Near Eastend, a family group of wrens that nested in a gravel pit was seen foraging on railway flatcars left near the nestsite.[17]

TABLE 1. Rock Wren records in Saskatchewan and adjacent regions. Locations are mapped in Fig. 1. A list of observers, correspondents, institutions and abbreviations follows this table. Initials of observer(s) are differentiated from record sources by a dash, e.g., 'FGB—KR pc' indicates that the observation was made by Fred G. Bard; the source of the record was Keith Roney, personal communication.

**SASKATCHEWAN**

FRENCHMAN R.-CYPRESS HILLS

1. ADAMS CK. 9 KM N OF MERRYFLAT. Pr ( ♀ with food), Jn 23/78 (WR po).

2. HARRIS RES. 1, Jy 9/77 (WH SL pc).

3. MAPLE CK. 1 ♂ col (SMNH), My 22/65 (WP-W—KR pc).

4. S OF SUPREME. "Several", Jn 19/41 (JDS—Soper 1970).

5. FRENCHMAN R. AT BELANGER CK. Family group, summer/74 (BG pc).

6. ROBSART. "Common", Jy-Ag/24 (MW—Williams 1946).

7. OLD MAN ON HIS BACK PLATEAU. 11, mostly juv; 3 ♂, 2 ♀ col, Jy 8/48 (WEG—Godfrey 1950). 1 singing ♂, Jn 24/78 (WR po).

8. SKULL CK. 4 records: Jn 1/34 (1 bird); Jn 8/48 (1); Jn 20/55 (2ad:*4yng*); My 31/66 (2) (SM—MG pc).

9. RAVENSCRAG. 1 ♂; 1 ♀ col (SMNH), Jn 3/25 (HHM—KR pc). 1 ♂ col (SMNH), Jn 6/25 (HHM—KR pc). "Family group", Ag 18/60 (RVF—Folker 1961). 8+, Jy 8/77 (WH SL pc).

10. EASTEND-RAVENSCRAG. Breeds; ESA: My 3; LFD: 15 Sp (LP—Bent 1948); nesting in gravel pit, 1930's (?) (LP—Potter 1932). Very common summer resident; ESA: My 1/76; LFD: Sp 13/75; 2 family groups in 1st 2 wks Ag/75 (MG pc).

11. EASTEND. 1 ♂, Jn 26/1894 (JM—Macoun & Macoun 1909). "Not uncommon", 1921 (PT HL—Godfrey 1950). 3 ♂ col (NMC), Jn 17/21 (HL—DR pc). 1 col (NMC), Jn 22/21 (PT—DR pc). 1 ♂ col. (SMNH), Jn 12/34 (FGB—KR pc). "Several", Jy 4/37 (JDS—Soper 1970). 2 ♂, 1 ♀ col (ROM), My 25/39 (CH—DR pc). 1 ♂ col (SMNH), Jy 8/51 (LD—KR pc). 1, Anxiety Butte, Ap 21/74 (JWi pc).

12. BOUNDARY PLATEAU S OF

STAYNOR HALL. 2 singing ♂, 1 ♀ nest building, Jn 24/78 (WR po).

13. FRENCHMAN R. AT HWY. #37. Several records: My 21/73 (4-5 wrens), My 23-24/73, My 4/74, Sp 1/74, Jn 12/77 (3+), Jn 13/77, Sp 5/77 (1) (JWi pc).

14. SWIFT CURRENT CK. 11 KM N & 3 W OF DOLLARD. "Several" singing ♂, Jn-Jy/78 (GA pc).

15. CLIMAX. "Noted sparingly", Jn 16/42 (JDS—Soper 1970).

16. FRENCHMAN R. AT MULE CK. Singing ♂♂, Jn-Jy/78 (GA pc).

17. FRENCHMAN R. (49°25'N;108°04'W). 2 singing ♂, My 25-26/74 (WR CET SS AW po).

18. HUFF L. Probably breeds (MG pc).

19. FRENCHMAN R. AT NEWTON RES. 3 singing ♂, My 27/74 (CET SS AW WR po).

20. VAL MARIE. 1, Jy 15/61 (RH—Hopper 1961).

21. FRENCHMAN R. AT PRAIRIE DOG BUTTE. "First seen" My 24/69 (JDS pc). "*Nest* in canyon", Jn 7/69 (JDC pc). 1 singing ♂, Jn 13/69 (JAW SW pc). "First seen", My 5/71 (JDC pc). 1, My 12/74 (JDC pc).

22. FRENCHMAN R. 13 KM SE OF VAL MARIE. "Seen", Jy 4/37 (JDS—Soper 1970). 1 singing ♂ (S5-T3-R12-W2M), My 24/77 (KF MJ pc).

23. FRENCHMAN R. AT U.S. BORDER. "Several", Jn 14-17/41 (JDS—Soper 1970). "Seen", My 17/70 (JDC pc). 10+ singing ♂, My 23/77 (KF MJ pc).

24. BATTLE CK. (location imprecise; not mapped). "Noted sparingly", Jn 20/42 (JDS—Soper 1970).

25. CYPRESS HILLS (location imprecise; not mapped). 1 ♂ col (ROM), Jn 24/17 (HHM—DR pc). "Common", Jy-Ag/24 (MY—Williams 1946). Pr, *nest with 8 fresh eggs* col, Jn 1/25 (HHM—Bradshaw 1926).

### WOOD MTN.-BIG MUDDY AREA

26. KILLDEER BADLANDS INCL. ROCK AND MORGAN CK. 2 seen, 1 col, Jn 14/1895 (WSp—Macoun and Macoun 1909). "Not uncommon", Lonesome Butte, Sp 9-17/27 (JDS—Soper 1970). "A moderate no.", Rock Ck., Jn 5-8/40 (JDS—Soper 1970). 1 col, Jy 25/64 (CE—KR pc). "Common", My 16/65 (RC GW WHB CE—KR pc). 12 seen, mostly singing ♂, My 24/75 (WR KF MJ po). 5+, Jn 15/76 (WH SL pc).

27. TWELVE-MILE L. Pr, Jn 5-7/40 (JDS—Soper 1970).

28. FIFE L. "A moderate no.", 1 ♂ col, Jn 5-8/40 (JDS—Soper 1970).

29. ROCKGLEN. 4 seen, Jy 16/77 (BK pc). 1, Jn 16/76 (WH SL pc).

30. GOOSE CK. "Rather common; undoubtedly breeding", summer/75 (GA pc).

31. BIG MUDDY VALLEY & L. "Not uncommon", Sp 18-27/27 (JDS—Soper 1970). "Fairly common", 1 ♂, 1 ♀ col, Jn 5-7/38 (JDS—Soper 1970). *Nest with 2 eggs*, Jn 20/59 (RC—PNRS). "Common", My 30/65 (RC BH WHB—KR pc). 3, Jn 18/69 (JAW SW pc). 3, My 28/76 (DH pc).

32. AVONLEA BADLANDS. "Nesting", 1934 (obs?) (Bradshaw 1935).

33. HARP TREE. 1 ♂ col (SMNH), Sp 22/30 (FGB—KR pc).

### SOURIS R. DRAINAGE

34. SOURIS R. BADLANDS W OF HALBRITE. 2, Ag 6/46 (JDS—Soper 1970).

35. COAL SPOILS NEAR ESTEVAN. "Up to 10 to 20 per day", summer/74 (BG pc). 2, Jn 7/77 (DH pc).

36. ROCHE PERCEE. Late Ag/26 (Bradshaw 1927).

### S. SASKATCHEWAN R.-LOWER SWIFT CURRENT CK.

37. LEMSFORD FY. "*Nearly-fledged yng* noted with parents", Jy 5/58 (GF pc).

38. S. SASKATCHEWAN R. 16 KM S & 14 KM E OF ESTON. 1 singing ♂, Jn 8-12/70 (JDR pc).

39. S. SASKATCHEWAN R. S OF ESTON. 4+ in family group, Ag 3/72 (AS pc).

40. S. SASKATCHEWAN R. 18 KM S OF WHITE BEAR. "Regularly noted; frequently seen carrying food into cracks", 1960's and 70's (SJ pc).

41. SASKATCHEWAN LANDING. 2, Ag 20/76 (BLy pc). 2, Sp 19/78 (GA pc).

42. MOUTH OF SWIFT CURRENT CK. 2, Jn 11/67 (JAW SW pc). *Nest with 5 eggs*, Jn 20/71 (WH—PNRS). "Several heard", Jn 23/73 (WH pc). 5, Jy 16/77 (BG pc).

43. S. SASKATCHEWAN R. N OF MAIN CENTRE. 2 col (SMNH), Ag 11-12/64 (RC—KR pc).

44. MATADOR INTERNATIONAL BIOLOGICAL PROGRAMME GRASSLAND. "Uncommon summer resident", ESA: My 6/72; LFD: Ag 24/73; *nest with 3 fledged yng*, Jy 13/67 (MG); 5-6 in family group (2 col), Jy 22/67 (DS MG)—(GA BF MG BP DS AS—AS pc, Maher 1974). 1 singing ♂, Sunken Hill, Jn 18/72 (WH pc).

45. S. SASKATCHEWAN R. AT RIVERHURST FY. "Pr with food", 1st wk Jy/76 (BLu—GA pc).

#### QU'APPELLE R. DRAINAGE

46. PUMPING STATION AT BUFFALO POUND LAKE. Pr, Sp 12/59 (JWa—Knight 1967).

47. ARM R. VALLEY AT FINDLATER. 1 singing ♂, Ag 28 & Sp 19/59 (MB—Callin, in prep.).

48. QU'APPELLE R. VALLEY AT MOOSE JAW CK. 1, Jn 29/77 (SL pc).

49. BRORA. 1, My 19-22/50 (TB—Belcher 1961).

50. VALEPORT. 1♂, 1♀ col, in breeding condition (SMNH), My 30/50 (FL—KR pc).

51. QU'APPELLE VALLEY AT BOGGY CK. 1 singing ♂, Jn 24/71 (MB BC Fr. Bedard—MB pc).

52. BOGGY CK. 1, Ag 21 & 24/64 (DG—MB pc).

53. CONDIE. 1, Jn/71 (FL—MB pc). 1, Jy 22/73 (FL—MB pc).

54. REGINA. 1, Wascana L., My 16 & 21/59 (FHB EF RFo—Belcher 1961). 1, My 14/59 (obs?) (Lahrman 1959). 1, Jy 15/59 (FL—Belcher 1961). 3, Ag 28/59 (JMS DHS—Speirs & Speirs 1960). 1, Sp 13/59 (FHB pc). 1, Ap 28/62 (MB pc). 1, My 15/65 (obs?) (Brazier 1965).

55. 7 KM E OF REGINA. 1, Ap 26/32 (HHM—Belcher 1961'.

56. PILOT BUTTE. "The nest, assumed to be in a cutbank of a gravel pit, was not located, but the pair was seen several times during the summer [of 1936]" (Belcher 1961); 1 juv ♀ col, Ag 15/36 (NA FGB—KR pc). 1, My 13/78 (RD—MB pc).

57. RICHARDSON. 1, My 17/59 (FHB—Belcher 1961'.

58. QU-APPELLE VALLEY FROM PASQUA L. TO A POINT 22 KM W. "5 and possibly 6 birds at scattered points", Ag 30/59 (EMC—Callin, in prep).

59. PASQUA L. 1, My 10, Ag 24 & Sp 15/59; 1, My 15/60 (EMC—Callin, in prep).

60. LEBRET. 1 singing ♂, My 11/52 (EMC—Callin, in prep).

61. QU'APPELLE VALLEY N OF BROADVIEW. 1, Sp 13/60 ("Thacker"—Callin, in prep).

62. SCISSOR CK. NEAR ROUND LAKE. 1 singing ♂, Jy 5/59 (EMC—Callin, in prep).

63. PERCIVAL. 1, Jn 2/38 (EMC—Callin, in prep). 1 "remained for several days" about 1942 (EMC—Callin, in prep).

64. QU'APPELLE VALLEY N OF WHITEWOOD. 1, My 30/70 (EMC—Callin, in prep).

65. IMPERIAL. 1 singing ♂ in gravel pit (date ?) (FGB FL pc).

66. N END OF LAST MOUNTAIN L. (JWa—in Knight 1967).

#### OTHER AREAS

67. FLORAL. 1, Sp/74 (WM—Shadick 1975).

68. MUDDY L. HILLS S OF UNITY. 5+ ad (incl 3+ singing ♂); *nest with 2+ large yng*, Jn 27/73 (WR JRo po). 1 singing ♂, Jn 27/78 (WR po).

69. KAZAN L. 1, Jn 12/42 (TR—Randall 1962).

### EASTERN ALBERTA

70. MILK R. VALLEY. "Common", Jy/1895 (JM—Macoun & Macoun 1909). "Noted 6 times", lower Milk R. gorge, Ag 13-Sp 1/23 (WM—Williams 1946). "within hearing at all times", My 30/71 (WSm—Smith 1972).

71. MEDICINE HAT. "Common in song", Jn 16/26 (MW—Williams 1946).

72. ELKWATER L. "Common . . . until Ag 14"/26 (MW—Williams 1946).

73. RED DEER R. Breeds (Salt & Salt 1976).

### NORTHEASTERN MONTANA

74. FORT PECK DAM. 10+ singing ♂ in rip-rap of embankment, summer/76 (CC pc).

75. 8 KM E OF SAVOY. 1 singing ♂, My 29/72 (PS pc).

76. BOWDOIN NATIONAL WILDLIFE REFUGE. "Uncommon transient" (JF—PS pc).

77. MISSOURI R. AT WOLF POINT. 4 singing ♂, My/77; 1, Jn-Jy-Ag/77 (LT—PS pc).

78. MISSOURI R. AT FT. UNION. Breeding (?) (JA—PS pc).

### NORTHWESTERN NORTH DAKOTA

79. MISSOURI R. NEAR MOUTH OF LITTLE MUDDY CK. Probable breeding (Stewart 1975).

80. MISSOURI R. Probable breeding (Stewart 1975).

81. MISSOURI R. Probable breeding (Stewart 1975).

82. DES LACS R. Definite breeding locality (Stewart 1975).

83. MOUSE R. Definite breeding locality (Stewart 1975).

#### OBSERVERS, CORRESPONDENTS AND INSTITUTIONS

NA: Albulet, N., GA: Anweiler, Gary G., JA: Audubon, John J., FGB: Bard, Fred G., WHB: Beck, W. Harvey, MB: Belcher, Margaret, TB: Beveridge, Thos. M., FHB: Brazier, Frank H., EMC: Callin, E. Manley, CC: Carlson, Charles M., RC: Carson, Ralph D., JDC: Chandler, J. David, BC: Cruickshank, Betty, RD: Donison, Robyn, LD: Dreger, L., CE: Elliott, C., BF: Felske, Brian E., KF: Finley, Kerry J., RVF: Folker, Robert V., JF: Foster, John, EF: Fox, Elmer, GF: Fox, Glen A., RFo: Fox, Reginald, DG: Gilroy, Doug, WEG: Godfrey, W. Earl, BG: Godwin, Bob C., MG: Gollop, Michael A., WH: Harris, Wayne C., BH: Haysom, B., DH: Hjertaas, Dale G., CH: Holmes, Charles F., RH: Hooper, Ronald, MJ: Jasieniuk, Marie, SJ: Jordheim, Sig O., BK: Kreba, Bob, BLu: Luterbach, Bob, BLy: Lyon, Bruce, FL: Lahrman, Fred, HL: Laing, Hamilton M., SL: Lamont, Sheila M., JM: Macoun, John, WM: Maher, William J., SM: Mann, Steve A., HHM: Mitchell, H. Hedley, NMC: NATIONAL MUSEUM OF CANADA (Ottawa), WP-W: Plowden-Wardlaw, W.J., LP: Potter, Laurence B., PNRS: PRAIRIE NEST RECORD SCHEME, BP: Pylypec, Bohdan, TR: Randall, Thomas E., WR: Renaud, Wayne E., DR: Richardson, Dorothy M. (ROM), JDR: Rising, James D., KR: Roney, Keith (SMNH), JRo: Rowe, John, ROM: ROYAL ONTARIO MUSEUM (Toronto), DSa: Sadler, Doug, SMNH: SASKATCHEWAN MUSEUM OF NATURAL HISTORY (Regina), SS: Schaafsma, Schewart, PS: Skaar, Palmer D., AS: Smith, Alan R., WSm: Smith, Wayne, JDS: Soper, J. Dewey, DSp: Speirs, Doris H., JMS: Speirs, J. Murray, WSp: Spreadborough, William, PT: Taverner, P. A., LT: Thompson, Larry, CET: Tull, C. Eric, JWa: Walker, John, GW: Watson, G., JAW: Wedgwood, Jim A., SW: Wedgwood, Shirley, JWi: Wilkinson, Jack, MW: Williams, M. Y., AW: Wisely, Al N.

LIST OF ABBREVIATIONS

ad = adult, Ag = August, Ap = April, Ck. = creek, col = collected, ESA = earliest spring arrival, Fy. = ferry, incl = including, Jn = June, Jy = July, juv = juvenile, km = kilometer, L. = lake, LFD = latest fall departure, M = meridian, My = May, obs = observer, pc = personal communication, po = personal observation, prep = preparation, R. = river, Res. = reservoir, Rg = range, S = section, Sp = September, T = township, yng = young, ♂ = male, ♀ = female.

## Summary

ROCK WREN (*Salpinctes obsoletus*). Locally common summer resident, 21 April to 27 September (usually early May to mid-September). Breeds regularly along the Frenchman River and tributaries, Battle Creek and tributaries, upper Swift Current Creek near Dollard, Old Man On His Back Plateau, Boundary Plateau, Big Muddy Lake-Wood Mountain district (north locally to Avonlea), Estevan spoil piles, lower Swift Current Creek, South Saskatchewan River from the Alberta border to Riverhurst, Muddy Lake near Unity; probably breeds irregularly northeast to the north end of Last Mountain Lake, Pilot Butte near Regina, and in the Qu'Appelle Valley east to at least Pasqua Lake, perhaps to north of Whitewood. Occurs as a vagrant north to Floral and Kazan Lake. Nesting habitats include outcroppings of sedimentary bedrock, eroded river breaks, spoil piles; less regularly gravel pits, road cuts, riprap on dams and causeways. Forages in a variety of habitats including woodpiles, culverts, stone fences, and rock and cement piles.

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This paper embraces the records of a large number of competent field-naturalists. I gratefully acknowledge all those persons listed in Table 1 whose observations form the basis of this review.

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cupied by the Rock Wren in the Estevan area.

Kerry J. Finley, J. Bernie Gollop, Michael S. W. Bradstreet, C. Stuart Houston and W. John Richardson critically read early drafts of the manuscript. The technical support provided by LGL Ltd. in preparing this report is greatly appreciated.

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# THE SPREAD OF THE WESTERN KINGBIRD ACROSS THE PRAIRIES

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The Western Kingbird, long known as the Arkansas Kingbird, has served as an indicator species reflecting habitat changes that followed settlement on the Prairies. Because the Western Kingbird is a conspicuous and distinctive bird that seeks out man, nesting chiefly in farm shelterbelts and along residential streets in cities and villages, we have more detailed documentation for this species than we have for most others. It is also somewhat unusual in that it rarely wanders beyond its breeding range, so that first records of the Western Kingbird for most areas have involved breeding pairs.

The Western Kingbird was not a summer resident of the plains of Saskatchewan and Manitoba before the advent of planted trees in North Dakota, it was initially confined to the river valleys in the southwest corner of the state. In 1873 J. A. Allen reported it as "exceedingly abundant wherever there is timber" along the Missouri River[1] and in 1874 G. B. Grinnell found "one or more pairs in every wooded ravine along the Little Missouri River."[12] Coues found none along the 49th parallel from the Red River west to the west loop of the Souris River in 1873, but in 1874 he found them in wooded valleys of the Missouri River tributaries throughout northern Montana, westward from the present site of Culbertson.[9] In 1880, John Macoun found them in the wooded valleys of the Cypress Hills in southwestern Saskatchewan, but none north or east of there.[23] In 1895, J. E. Houseman found 13 nests along the Bow River at Calgary and in 1894 Spreadborough found them along the South Saskatchewan River at Medicine Hat.[15 24] There are no records to suggest that Western Kingbirds occupied the sparsely treed South Saskatchewan River valley within what is now Saskatchewan, either before settlement or in the first 30 years of settlement. We know with certainty that it was absent from the well-treed Qu'Appelle Valley.

## Spread across North Dakota into Manitoba

As settlement progressed in North Dakota, Western Kingbirds spread northeast. In 1892 they reached Cando, which had been settled in 1884.[18] Two pairs the first year used a binder and a windmill pump as nest sites. Although Cando was later to become known as the best-treed larger town in the state, its trees had still reached only 4 m in height by 1897. The Western Kingbird, nevertheless, became common at Cando by 1895 and by 1910, when the Manitoba maples and cottonwoods had matured, the Western Kingbird was as common as the Eastern Kingbird.[19] The Western Kingbird soon occupied all of North Dakota.[39]

Although Cando was only 40 miles south of Cartwright, Manitoba, it was

*Western Kingbird* *Fred W. Lahrman*

not until 1907 that Hamilton Laing recorded the first Manitoba nest and then collected the first Manitoba specimen at Oak Lake on 10 August.[13] [21] In 1909, H. M. Speechly made his first sighting near Crystal City and the next year a pair of Western Kingbirds nested at Pilot Mound.[38] In 1910, a teacher reported Western Kingbirds at Pierson and in 1911 B. J. Hales found a nest at Pierson and found other individuals at Waskada, Hartney, Virden and Brandon.[13] Thirty years after the Criddle family arrived, Norman Criddle made his first sighting at Treesbank in May 1912, and the same month A. G. Lawrence saw his first Western Kingbirds near Winnipeg.[41] In 1917, Criddle reported that a pair had nested near Oak Bluff, only 14 miles southwest of Winnipeg, with seven pairs resident in the town of Souris and another pair at Stockton, 7 miles east of Treesbank.[10] By 1921, P. A. Taverner and Hoyes Lloyd found Western Kingbirds well settled in "small tree plantations that decorate . . . the immediate vicinity of railroad stations" throughout southern

Manitoba from Virden, Brandon and Portage la Prairie north to Oak Point and east to near Lockport.[41] By 1932, they had spread north to Lake St. Martin at 51° 43' N, and by 1951 they were regular as far east as Lac du Bonnet, Whitemouth and Elma.[37] [11] Two nests in farm shelterbelts near Dauphin were found by W. J. Walley and Florence Fisher in 1974 and in 1975 Walley found another Western Kingbird nest in a farm shelterbelt 5 miles east of Sifton at 51° 21' N.

## Spread across Saskatchewan

The first record for what is now eastern Saskatchewan was an adult and a juvenile collected 20 August 1891 by D. Losh Thorpe at the Souris coalfields, near the later site of Estevan, and reported to Ernest Thompson [Seton], who knew of no Manitoba records to that time.[36] Walter Raine reported none from Rush Lake and Crane Lake, just north of the Cypress Hills, in 1891 and 1893,[30] [31] but Macoun found them nesting at Crane Lake in 1894.[24] In 1895, Macoun found Western Kingbirds no farther east than the northwest corner of Old Wives Lake. A. C. Bent's party in 1905 and 1906 recorded Western Kingbirds in the timber along Skull Creek and Maple Creek, "nesting principally in the larger trees."[6]

After residing near Indian Head since 1887, George Lang first recorded the Western Kingbird in his eighth annual list of migration dates in 1910, when two were seen on 2 June; they were "moderately common" by 10 June. That year there were two nests on crossarms of telephone poles, and in 1913 when two arrived on 25 May there is again a note "nesting on crossarms of telephone poles in the town." The railroad had reached Indian Head in 1882. Trees planted at the Experimental Farm on the eastern edge of Indian Head in 1889 had with careful attention and watering reached 2 to 3 m in an 1893 photo, though no trees were yet visible in the town itself. By 1899, cottonwoods on the farm had reached 8 m and pine trees 5 m in height. By 1910, when telephone poles still offered better nesting sites than trees, Ken Skinner recollects that the trees along the residential streets of the town were about 7 m high, and several of his contemporaries have given a similar estimate.

On 22 July 1916, Hedley Mitchell collected an adult and three fledglings at Regina Beach (museum accession list, fide Gary Anweiler). In July 1919, Mitchell found Western Kingbirds fairly common at Carievale in extreme southeastern Saskatchewan, where he found another nest.[7] In 1920, Mitchell found "quite a few" at Kedleston at the southwest corner of Last Mountain Lake, the northernmost record to that date.[8] In 1921, a single pair nested on a telephone pole behind the home of L. T. McKim in Melville, and this site was used for four successive years.[25] This was the only pair observed near Melville during those years and, although none were seen in 1925, they gradually became common thereafter.[16]

Although a few early settlers had brought tree seedlings with them, it was not until founding of the Dominion Forest Nursery Station south of Indian Head in 1904 that large scale planting of shelter belts on farmsteads became widespread. The best information as to the time relationship between the planting of such trees, and their achieving sufficient size to attract Western Kingbirds, comes from Tyvan. At the Harley Ranson farm northeast of Tyvan, trees were planted in 1903, and the first Western Kingbirds appeared in 1924.[3] At the Stewart Houston farm 5 miles west of Ranson's, trees were planted in 1917, the tallest trees reached 7 m in height about 1934, and this distinctive kingbird first took up residence in 1937.[29] At the Ledingham farm 6 miles west of Moose Jaw, where trees had been planted in the 1890's, the Western Kingbird did not appear until 1923 or 1924.[20] At Mortlach, Grose saw his first four birds on 9 June 1923, and then found a nest with eggs in a maple on 19 June.[20]

Western Kingbirds appeared in Regina in the early 1920's and became more common between 1933 and 1936,[2] about the time that trees on residential streets reached maturity. At Simpson, Western Kingbirds first nested in 1929, using the platform behind the transformer on a power pole.[14] The village began in 1910, the year before the advent of the railroad, and the sparse trees in the early thirties were not more than 7 m high, according to Thomas Harper.

At Percival, Western Kingbirds first appeared in 1927, but E. M. Callin did not see them regularly until 1936. At Wauchope a few scattered pairs appeared on farms in 1935,[27] [29] and the first nest in the village was photographed by H. H. Pittman in 1937.[22] Todd's extensive 1932 survey of the Davidson area, from Elbow to the north end of Last Mountain Lake, located only a single nest in the town of Davidson.[42] Western Kingbirds became regular at Lucky Lake about 1935.[33] Well documented first sightings in areas of previous absence are available from Bredenbury in 1937 and for both Saltcoats and Yorkton in 1940.[16] At Sheho the first sighting was in 1942, with others seen in 1946 and 1950 and most years since.[16] [28] Bob Gillard had his first sighting at Wynyard in 1976, a pair which raised two young in tall European poplars in his yard.

J. Dewey Soper found Western Kingbirds at Kyle, Elrose and Lanigan in 1939 and at Outlook in 1946, but they probably reached the first two towns some years earlier. The first record for the Saskatoon area was one collected by F. M. Mowat from three pairs present near Dundurn, on 28 May 1946. A. McPherson reported several pairs nesting along streets in Saskatoon in 1949, noting that they were "on the increase."[26] In 1956, Western Kingbirds were sighted between Waldheim and Laird and Spencer Sealy noted them nesting in Battleford in 1959.[17] [4] Bryan Rothenburger found a nest with four eggs in Radisson on 15 June 1969 (PNRS). Wayne Harris noted one pair present about 7 miles west of Naicam in 1972, and others were sighted at Naicam in 1975.[5] Brian Irving had his only Kelvington sighting of a pair nesting 6 miles west and 3 miles south of Kelvington on 6 July 1974.

Sightings by O. C. Furniss at Hoey and Domremy in 1939 were for many years the most northerly sightings in Saskatchewan. Maurice Mareschal found Western Kingbirds nesting behind a transformer on a power pole on the main street of Domremy in 1952, even though mature trees were present, and two pairs nested in the village of Birch Hills, just south of latitude 53°, in 1972 and 1973, an oddity not noted by the townspeople previously. The only record for the Nipawin area is of a single bird seen by Gary Anweiler near Codette on 30 June 1976. The most northerly nest record to date is that found by Wayne Renaud at Aquadeo Beach at the north end of Jackfish Lake, about 25 miles north of North Battleford, at 53° 08' N, on 3 July 1970.[4]

Perhaps the most northerly ocation where Western Kingbirds are as common as Eastern Kingbirds s in the town of Biggar, where G. J. Wapple counted 30 in an hour in the summer of 1974 as they sat on elevision aerials on residential streets.[32] Alan R. Smith sampled 98 deserted shelter belts in the Rural Municipality of Vanscoy between Saskatoon and Biggar, and found hat 18 had one resident pair and two had two pairs of Western Kingbirds, he ninth most numerous species recorded in these abandoned farmsteads. Sixteen of the 20 pairs of Western Kingbirds used shelter belts which contained tall domestic poplars, usually European poplars more than 10 m high. In contrast, shelter belts with caragana and ower trees such as Manitoba maples, were used more often by the Eastern Kingbird, with one pair in each of 98 shelterbelts.

## Alberta

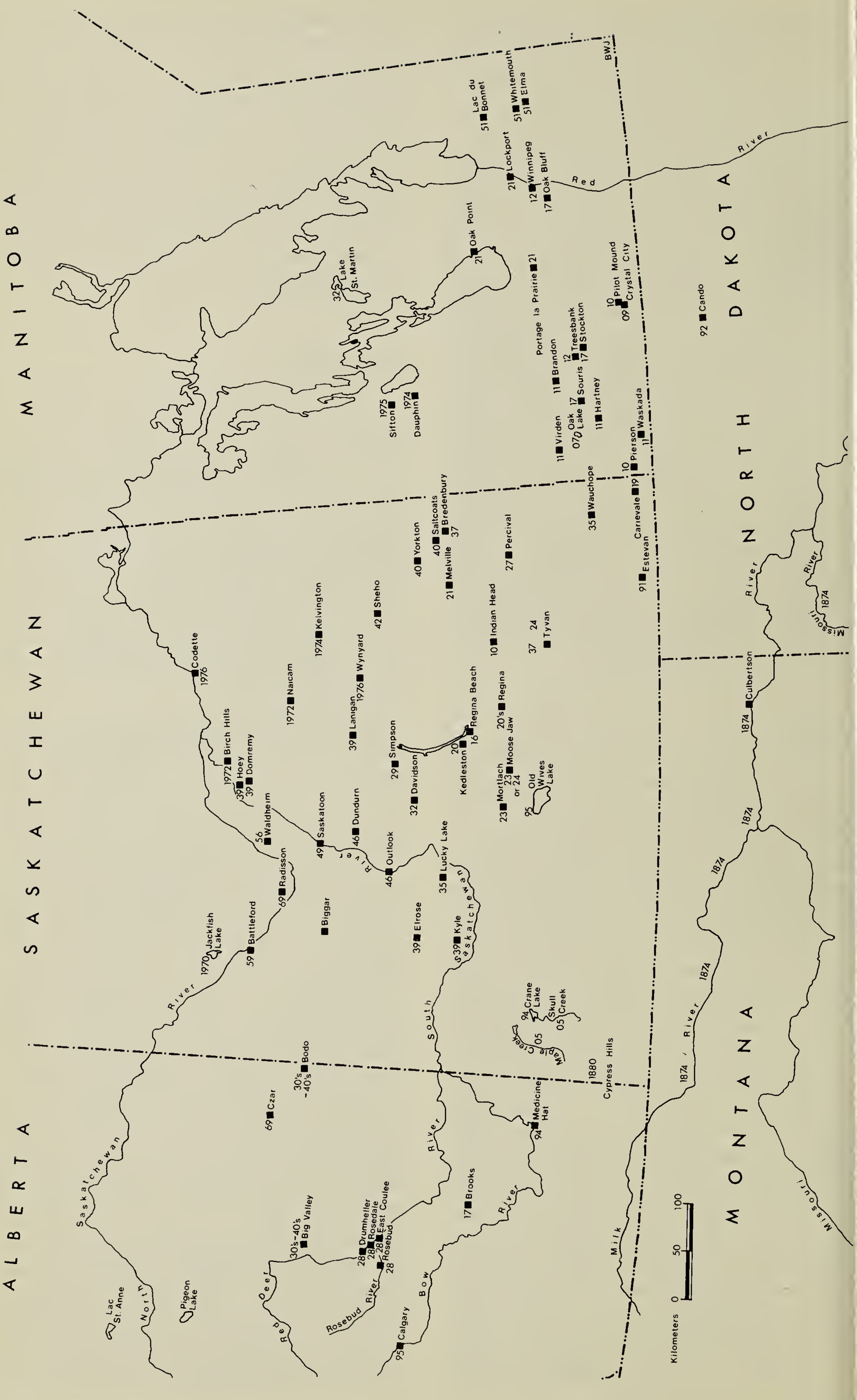
The Western Kingbird was, to the best of our knowledge, already a resident of the wooded valleys of the Milk, Bow and South Saskatchewan River valleys within Alberta before settlement. Certainly these areas were occupied in the 1890's. We do not know whether it might also have been a resident of the lower Red Deer River valley, where Taverner's party encountered it northeast of Brooks in 1917.[40] W. R. Salt found it urther up the Red Deer and Rosebud valleys in 1928, at Rosebud, Drumheller, Rosedale and East Coulee, and "received no inimations that it had only recently arrived." A modest spread to its norhernmost Alberta nesting sites at Big Valley and Bodo, both near 52°, may well have followed the growth of arm shelterbelts in the 1930's and 940's, although arrival dates are not on record.[34] [35] D. A. Boag sighted two Western Kingbirds during a breeding bird survey at Czar, 52° 26' N, in June 1969, but none were seen during six subsequent counts on the same route. Although stragglers have been encountered at Wembley, Jasper, Lac Ste. Anne, and Pigeon Lake,[34] [35] any range extension within Alberta has been minimal compared to that encountered in Saskatchewan and Manitoba.

## Discussion

The open plains of grassland across the southern portions of the present Prairie Provinces had been kept virtually treeless by repeated prairie fires. Apart from the ranching areas in the Cypress Hills region, settlement wrought a transformation as land was broken and seeded to crops. As a generality, it then took 20 to 30 years to grow substantial trees in farm shelterbelts and along village and city streets.

The Western Kingbird is, unlike its relative the Eastern Kingbird, more likely to occupy a shelterbelt or street-lined shade trees if these trees are 7 to 10 m high. Except for Cando, North Dakota, there are no records of the appearance of breeding pairs of Western Kingbirds before trees reached this height. Such trees were probably a requisite more for perching than nesting, since I have found Western Kingbird nests less than 2 m from the ground, and some early nests were on artificial poles.

Indian Head was a center of early tree plantations, and the Western Kingbird arrived there 21 years after the trees were planted and about 10 years earlier than at other Saskatchewan towns. A similar period of 20 or 21 years elapsed between tree planting and Western Kingbird arrival on two farms at Tyvan. At Simpson the interval was 19 years, but at Melville they appeared only 14


ALBERTA
SASKATCHEWAN
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NORTH DAKOTA
MONTANA
BWJ
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51 Whitemouth
51 Elma
21 Lockport
12 Winnipeg
17 Oak Bluff
Red River
21 Oak Point
21 Portage la Prairie
10 Pilot Mound
09 Crystal City
32 Lake St. Martin
92 Cando
12 Treesbank
17 Stockton
11 Brandon
17 Souris
11 Hartney
1975 Sifton
1974 Dauphin
11 Virden
07 Oak Lake
11 Waskada
10 Pierson
35 Wauchope
19 Carievale
91 Estevan
40 Yorkton
40 Saltcoats
37 Bredenbury
21 Melville
27 Percival
42 Sheho
1974 Kelvington
10 Indian Head
37 24 Tyvan
1976 Codette
1976 Wynyard
1972 Naicam
39 Lanigan
16 Regina Beach
20's Regina
20 Kedleston
29 Simpson
23 Moose Jaw or 24
23 Mortlach
Old Wives Lake
95
1972 Birch Hills
39 Hoey
39 Domremy
32 Davidson
46 Dundurn
56 Waldheim
49 Saskatoon
River
46 Outlook
35 Lucky Lake
Saskatchewan
69 Radisson
Biggar
39 Elrose
39 Kyle
South
1970 Jackfish Lake
59 Battleford
River
94 Crane Lake
05 Skull Creek
05 Maple Creek
1880 Cypress Hills
30's-40's Bodo
69 Czar
94 Medicine Hat
River
17 Brooks
Bow River
30's-40's Big Valley
28 Drumheller
28 Rosedale
28 East Coulee
28 Rosebud
Rosebud River
Red Deer
95 Calgary
Pigeon Lake
Lac St. Anne
North Saskatchewan
Milk River
1874
Missouri River
1874 Culbertson
Kilometers 0 50 100

*Western Kingbird* *Fred W. Lahrman*

years after arrival of the railroad. Elsewhere, as at Moose Jaw, Regina and Wauchope, Western Kingbirds were often not recorded for 30 years or more after trees were planted. By about 1940, when the Western Kingbird reached the treed "parkland belt," the species continued to nest in planted trees near homes and generally avoided the aspen "bluffs" scattered in fields and pastures.

All evidence suggests that the somewhat haphazard spread of the Western Kingbird from its original habitat in treed valleys, across the plains up to 300 miles to the east and north, was inextricably related to its ready affinity for human habitations and the increasing availability of planted trees.

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# A STUDY OF NESTING CANADA GEESE AT CONDIE NATURE REFUGE, SASKATCHEWAN

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The Condie Nature Refuge (Map 1) is located approximately 16 km northwest of Regina on No. 11 highway. The reservoir was created in 1924 by the C.N.R. to provide water for their locomotives, and in 1961 was acquired by Saskatchewan Tourism and Renewable Resources (then Dept. of Natural Resources) for preservation of the marsh and grassland as a nature refuge and recreation site. The 273.2-ha area is now intensively used for outdoor recreation by Regina schools. The reservoir and marsh provide a nesting and staging area for Canada Geese and some species of ducks.

The geese at Condie are mostly descendants from the Wascana Centre flock in Regina. Most of these geese are now crosses of *Branta canadensis maxima* and *B. c. moffiti* which are slightly smaller than *B. c. maxima* (Scott, personal communication).

From 11 May to 12 June, 1978 a nesting survey of Canada geese was conducted to determine nest numbers and locations, hatching success and gosling survival. A canoe was used to gain access to the islands and marshy areas. The author was aided by Rhonda Phillips and Larry Bogdan.

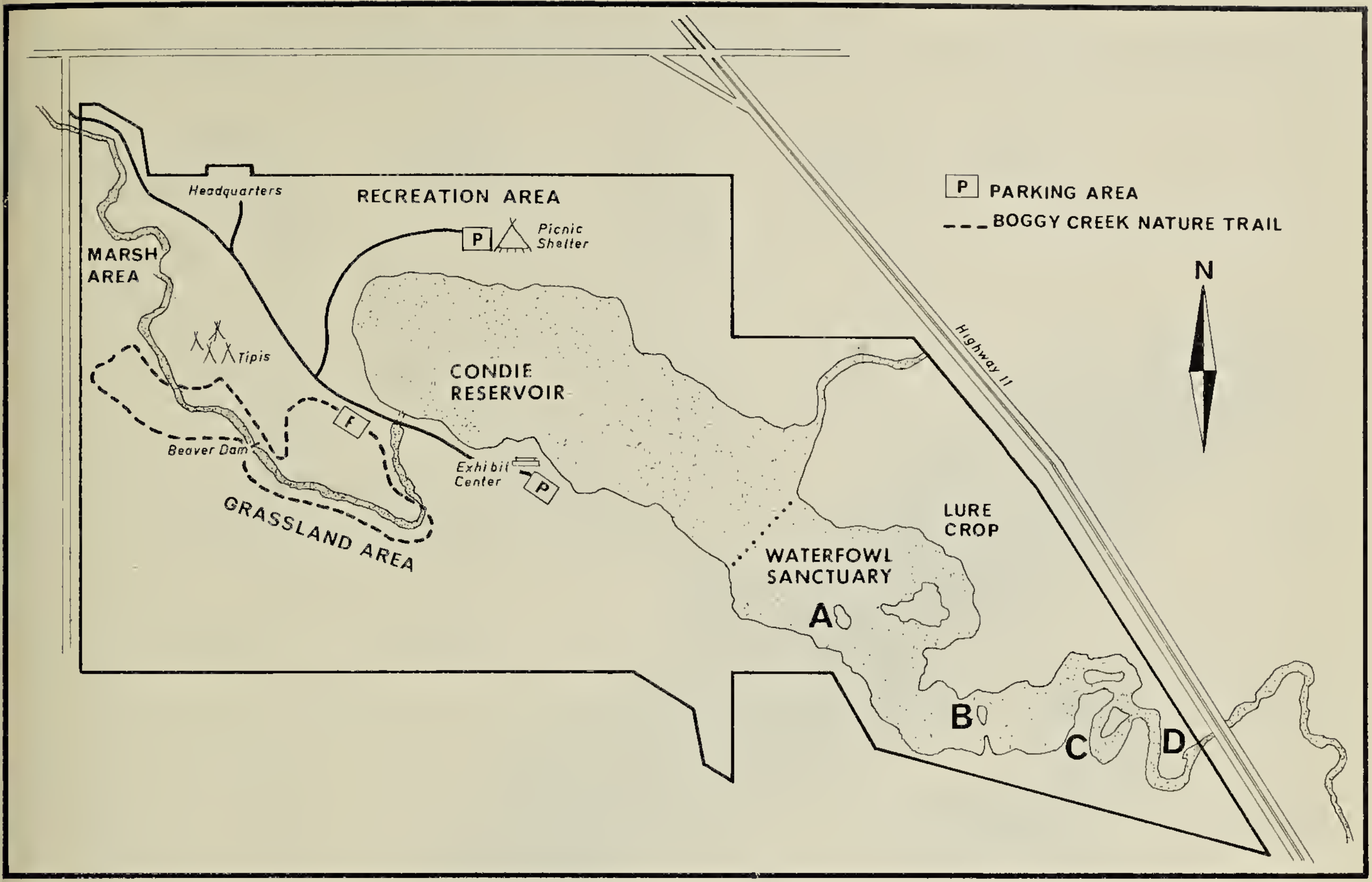
In addition to an academic interest in the numbers and success of nesting geese, the purpose of the study was to determine which areas of the refuge are most used by nesting and brood-rearing birds. The information gained may be used in planning of future interpretive developments, such as observation blinds or walking trails, so that disturbance of the geese may be minimized by people using the area.

## Nests

Table 1 is a summary of the results of the nest survey.

A small island (A), in map 1, in the waterfowl sanctuary contained eight nests (37 eggs). The vegetation consisted of many willow bushes with sparse ground cover at the beginning of the survey. By the end of the survey the nests were well concealed by increased vegetation. The substrate was dry. Six nests containing 24 eggs were abandoned. The other two nests hatched ten eggs.

Roosting Island (B) is small, has banked edges and little vegetative cover. This island was not checked until mid-way through the survey so the total number of eggs laid cannot be determined. There were two nests. One appeared to have already hatched and there was one egg beside the nest. The other nest hatched two eggs. Four eggs with holes in their sides, scattered near this nest, indicated predation. No definite conclusions can be made about success of eggs on this island,



*Map of Condie Nature Refuge*

but the percent of successful nests was at least 50%.

A marshy peninsula (C) contained four nests of which two (6 eggs) were abandoned probably as a result of flooding. One was at the base of a shrub on dry ground; the other was on a hill of mud at the shore.

A fairly open peninsula (D) with rocky soil, willow bushes and dock, contained two nests (ten eggs).

Two nests were located by the picnic shelter on the north side of the reservoir. This area consists of mowed lawns and a tree plantation. One nest in a small marshy area hatched all four eggs. The other nest on the top of the bank (approximately 1.8 to 2.4 m above the water) near the tree plantation, hatched three of four eggs. The gander from this nest was very aggressive and attacked the investigators.

Two nests (nine eggs) were located along the creek. There was no follow up on one nest of four eggs. The other nest hatched all five eggs. This nest was about 0.6 m above the water in a grassy area.

Other nests were; one with six eggs in thick rose bushes along the shore (hatched), one in willows at the shore opposite the nature centre (hatched three of five eggs), one with six eggs on the mainland at the base of a lone tree near the drainage ditch (hatched), one with six eggs in a small clump of shrubs near a marshy area (hatched) and one with eleven eggs at the base of a willow at the shore of the northeast side of the highway (hatched).

## Goslings

On 2 June and 12 June, 1978, at 8:00 a.m. goslings were counted. The count on 2 June was 45 goslings and on 12 June 42 goslings. This is approximately a 43% loss of goslings from the 79 eggs hatched. Considering total eggs laid (126), the success rate appears to be only about 36%.

TABLE 1. Summary of Canada goose nest locations, egg production, clutch sizes, nesting success and hatching success at Condie Nature Refuge, Summer, 1978.

| **Location** | **Number of nests** | **Number of eggs** | **Average number of eggs per clutch** | **Number of eggs hatched** | **% nests successful (hatched at least 1 egg)** | **% egg hatche** |
|---|---|---|---|---|---|---|
| Island A | 8 | 37 | 4.6 | 10 | 25 | 27 |
| Island B** | 2 | 7(Min*) | 3.5(Min) | 2(Min) | 50(Min) | 28.5(? |
| Peninsula C | 4 | 21 | 5.25 | 13 | 50 | 61.9 |
| Peninsula D | 2 | 10 | 5.0 | 10 | 100 | 100 |
| Picnic Area | 2 | 8 | 4.0 | 7 | 100 | 87.5 |
| Creek*** | 2 | 9 | 4.5 | 5(Min) | 50(Min) | 55.5(? |
| Other | 5 | 34 | 6.8 | 32 | 100 | 94.1 |
| TOTALS | 25 | 126(Min) | 5.04(Min) | 79(Min) | 76(Min) | 62.6 |
| **Island B | 1 | 1(Min) | 1(Min) | ? | ? | ? |
| | 1 | 6(Min) | 6(Min) | 2 | 100 | 33 |
| ***Creek | 1 | 5 | 5.0 | 5 | 100 | 100 |
| | 1 | 4 | 4.0 | ? | ? | ? |

* = Minimum

In the morning, the popular areas for the geese and goslings to feed were on the grass by the picnic shelter and in the lure crop field. A few families were observed on the grassy southwest shore and by the pond on the northeast side of the highway.

## Discussion

When selecting nest sites Canada geese consider the following: 1) abundance of nesting material, 2) island nest sites, 3) closeness to water, 4) firmness of nesting substrate, 5) closeness of grazing area, 6) presence of loafing sites, 7) absence of other nests, 8) good visibility from nest sites and, 9) a closeness of brood rearing area.[1]

At Condie Nature Refuge all nests were close to water and had good visibility, at least at the beginning of the nesting season. The lure crop field and lawns provide grazing areas and goslings can be hidden in the long grass and reeds. The island nest sites were the least successful, probably because of crowding and interactions between pairs. The most successful nests were along the shore and on the dry section of a marshy peninsula. The other three islands (Map 1) are only reed beds; there is no firm substrate.

At Condie, the average clutch size was 5.0, the nesting success was 76% and the hatching success was 62.6%. These results are comparable to other studies. At Waterhen Marsh, Saskatchewan, the average clutch size was 5.6, average nesting success was 82.7% and hatching success was 77.4%.[1] Clutch sizes at Marshy Point, Manitoba, averaged 5.7 in 1969 and 5.6 in 1970 and 1971.[2] Nest success ranged from a low of 65% in 1970 to 82% in 1971 and egg success averaged 67%.[2]

*Canada Geese* *Fred W. Lahrman*

The following information is from Wascana Centre (L. Scott, personal communication). In 1978 there were 250 nests (1,400 eggs) on Wascana Lake with an average clutch size of 5.6 eggs. In 1977 average clutch size was 4.5 and in 1976 was 6.0. Only 700 goslings were raised in 1978 for a success rate of 50%. All the nests at Wascana were on islands or in fenced areas so there was little harassment by dogs or humans. There are a few mink but their effect on nests is not known. Territorial combats between geese resulted in a high number of abandoned nests.

At Condie there appeared to be a 43% loss of goslings from the 79 eggs hatched, to make a total success rate of only 36%. This apparent loss is inexplicable. Only one dead gosling was found. Possibly the goslings were taken into other brood-rearing areas. At Waterhen Marsh, observed mortality prior to brood mixing and for coloured broods less than 2 weeks old was about 7%.[1] However, at the end of the flightless period there appeared to be a reduction of 65%. It was assumed that there were unknown brood-rearing areas.[1] In Utah average mortality during brood rearing was only 7% for 3 years combined; most mortality probably occurred in the week following hatching.[3] At Seney National Wildlife Refuge, Michigan, gosling survival rates were 16% in 1964, 78% in 1963 and 72% in 1965 with most mortality probably in the first 3 to 4 weeks.[4] Predation appeared to be the main limiting factor on goose production although disease was also important.[4]

Very few of the geese were protective of their nests or goslings against human interference. In Michigan, it was also found that goose pairs would usually depart rather than defend.[4]

Six nests or 24% of the nests at Condie Nature Refuge were deserted for reasons unknown. Flooding appeared to be the reason in two of the nests and predation in at least two. Other causes for nest loss are destruction, infertile eggs and embryo death.

## Conclusions

The productivity of geese at Condie Nature Refuge was a little lower than in other studies. Perhaps the area could be improved by providing other nesting sites. At Marshy Point, Manitoba, nest success was highest (77%) among nests in nest boxes and on muskrat houses and lowest (69%) for ground nests.[2] Nest success on islands at Condie was very low likely due to overcrowding. A few artificial nesting structures could be installed to determine if geese would use them.

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# WHOOPING CRANE SIGHTINGS PRAIRIE PROVINCES 1977 AND 1978

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Voluntary reports of Whooping Cranes seen in the Prairie Provinces were solicited enthusiastically by Charles L. Broley of Winnipeg, Manitoba about the end of WWII.[1] Broley systematically alerted journalists, broadcasters, school teachers, sportsmen, policemen, businessmen, government officials and others, essentially anyone who would listen, to the need for information on the distribution of Whooping Cranes. The search was on by naturalists at that time for the breeding locations in Canada of Whooping Cranes that wintered near Rockport, Texas. Beginning in the spring of 1945 those reports from volunteers and others were collected, collated and interpreted by Fred Bard of Regina. Bard, later Director of the Saskatchewan Museum of Natural History (SMNH), continued receiving reports and after his retirement the staff of the museum carried on until the summer of 1977. About this time the responsibility was reconsidered, then assumed by Canadian Wildlife Service (CWS) and assigned to staff at Prairie Migratory Bird Research Centre (PMBRC), Saskatoon. The voluntary reports were still seen as useful preliminary data in migratory bird conservation and most usefully carried out as close as possible to that errand. Methods used and results to date are reported here.

Reports on birds believed to be Whooping Cranes were received at PMBRC. Reports by mail were either on forms distributed by CWS to wildlife management agencies in the Prairie Provinces or in letters. Information received by telephone was recorded at PMBRC. On receipt, all records were assigned a number. When validity and relationship to other records was determined a unique number for future reference was assigned. All records thus received were bound and catalogued in the Canadian Wildlife Service library, Saskatoon.

Whooping Crane reports from technical or professional employees of a wildlife management agency were accepted without question. Similarly, sight records that were accepted by a museum or wildlife management agency were not questioned by Canadian Wildlife Service. Agencies contributing information were as follows: Alberta Department of Parks Recreation and Wildlife (APRW), Manitoba Department Mines Natural Resources and Environment (MRRTS), Saskatchewan Departments of Tourism and Renewable Resources (STRR) and Northern Saskatchewan (SNS), United States Fish and Wildlife Service (USFWS) and Royal Canadian Mounted Police (RCMP). If the sighting was not accepted as valid when received, an investigation was attempted by interview, mail or visiting the site. The data gathering system was essentially the same as that used in the past by Bard and others.

The decision to investigate on site was based on likely yield of information per unit of effort. If biological characteristics described by the observer fitted Whooping Cranes, if the birds were not flying, if the observation was made within a day, then an investigation was made by (or requested of) a qualified wildlife management officer. If investigation could not be made, or was in-

TABLE 1. Accepted Whooping Crane sightings Prairie Provinces, 1977-78.

| | Location | Number[1] | Date | Observer remarks, CWS record |
|---|---|---|---|---|
| 1. | Willmar, SK<br>49°,102°;5-4-W2 | 2 | 24/04/78 | T. Leggatt, accepted by STRR; 78-04-03 |
| 2. | Creelman,SK<br>49°,103°;10-11-W2 | 3 | 16/09/77 | D. Danaluk, STRR "birds had been present for 3 weeks"; 77-09-04 |
| 3. | Tribune,SK<br>49°,103°;4-14-W2 | 2:1 | 24/10/77 | S. Barber, STRR; 77-10-16 |
| 4. | Talmage,SK<br>49,103°;9-12-W2 | 3 | 05/10/77 | D. Harvey, STRR seen again 6, 11,14/10; 77-10-05 |
| 5. | Skiff,AB<br>49°,111°;5-13-W4 | 1 | 15/09/77 | A.G. Loughrey, CWS, seen again 16/09; 77-09-03. |
| 6. | Eyebrow,SK<br>50°,106°;23-2-W3 | 1 | 02/09/77 | H. Hedger, STRR, lone "adult" present until 03/09 p.m.; 77-09-01 |
| 7. | Paysen Lake,SK<br>50°,106°;20-6-W3 | 2 | 23/08/78 | D. McGregor, accepted by SMNH; 78'08'01 |
| 8. | Mortlach,SK<br>50°,106°;18-1-W3 | 2 | 18/10/78 | D. Flack, seen again 19,20/10 accepted by SMNH; 78-10-07 |
| 9. | Antelope,SK<br>50°,108°;14-18-W3 | 5 | 10/10/78 | F. Bard, accepted by SMNH; 78-10-02 |
| 10. | Gypsumville,MB<br>51°,98°;32-8-W1 | 2U | 16/04/78 | C. Rhur, MRRTS; 78-04-01 |
| 11. | Kandahar,SK<br>51°,104°;32-17,18-W2 | 2 | 25/09/78 | R. Blyth, E.J. Brady, confirmed by STRR, present daily until 12/10; 78-09-02 |
| 12. | Lockwood,SK<br>51°,104°;31-20-W2 | 1 | 31/10/77 | L. Fargo accepted by STRR possibly extension of record 77-08-05; 77-10-17 |
| 13. | Watrous,SK<br>51°,105°;31-26-W2 | 1 | 07/07/77 | R. Hanson, USFWS; 77-07-01 |
| 14. | Govan,SK<br>51°,105°;28-23-W2 | 4:1 | 15/10/77 | R. Kreba and others, confirmed STRR, CWS, 15,16,17/10, juvenile with red band right leg; 77-10-12 |
| 15. | Simpson,SK<br>51°,105°;27-24-W2<br>104°;28-22-W2<br>;28-23-W2<br>;28-24-W2<br>;29-22-W2<br>;31-21-W2 | 1 | 24/08/77 | K. Roney, accepted by SMNH, confirmed by CWS and others, seen again 20,21,24,27/09, 02/10 possibly same bird as 77-07-01; 77-08-05 |
| 16. | Zelma,SK<br>51°,105°;32-28-W2 | 2 | 06/10/78 | E. Dieno and others, confirmed by STRR, seen again 7,9,12,17 21/10; 78-10-03 |
| 17. | Pike Lake,SK<br>51°,106°;32-6-W3 | 2:1 | 26/09/77 | E. & W. Howe, accepted by CWS, seen again 27/09; 77-09-06 |
| 18. | Pike Lake,SK<br>51°,106°;34-6-W3 | 1 | 22/08/77 | R. K. Brace, CWS, seen again 29, 30/08; 77-08-04 |
| 19. | Hawarden,SK<br>51°,106°;28-5-W3 | 5 | 07/10/77 | C. Olson, STRR and others seen again 08/10; 77-10-08 |
| 20. | Hawarden,SK<br>51°,106°;28-5,6-W3 | 3 | 21/10/77 | E. McMurchey & son confirmed by STRR present again 22,24,25/10; 77-10-14 |
| 21. | Tessier,SK<br>51°,107°;32-10-W3 | 5 | 18/09/77 | G. Gordon, STRR and others; 77-09-05 |
| 22. | D'arcy,SK<br>51°,108°;29-19-W3 | 2 | 06/10/78 | K. Johnson, accepted by STRR; 78-10-01 |
| 23. | Humboldt,SK<br>52°,105°;39-22-W2 | 1 | 15/09/77 | D. Kelly, STRR; 77-09-02 |
| 24. | Peterson,SK<br>52°,105°;38-26-W2 | 6 | 12/10/78 | F. Bendig, J. Kirzinger, confirmed by STRR, present since end of Sept and until 28/10; 78-10-04 |

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|---|---|---|---|
| 25. Cudworth,SK<br>52°,105°;40-24-W2 | 1 | 11/10/77 | D. Kelly, STRR seen again 13/10; 77-10-10 |
| 26. Dana,SK<br>52°,105°;38-26-W2 | 2 | 22/10/77 | D. Kelly, R. Clary, STRR; 77-10-15 |
| 27. Batoche,SK<br>52°,106°;43-1-W3 | 2 | 07/08/77 | Mrs. B. Berg, accepted by STRR; 77-08-01 |
| 28. Blaine Lake,SK<br>52°,106°;40-6-W3 | 2 | 11/08/77 | K. Steuart, accepted by SMNH; 77-08-32 |
| 29. Aberdeen,SK<br>52°,106°;39-2-W3 | 3 | 03/10/77 | B. Rafuse, “flying”; accepted by CWS; 77-10-01 |
| 30. Aberdeen,SK<br>52°,106°;36-2-W3 | 3(5) | 08/10/77 | Mrs. Mason, 5 confirmed by CWS 17/10, reported 3 present “about 2 weeks, 2 more last 2-3 days” possibly extension of record 77-10-03; 77-10-09 |
| 31. St. Denis,SK<br>52°,106°;37-1-W3 | 3(4) | 05/10/77 | P. Fretz and others, accepted by CWS; 4th Whooping Crane reported present 06,07/10 CWS checked. None present 10/10; 77-10-03 |
| 32. Blaine Lake,SK<br>52°,107°;45-7,8-W3 | 6:1 | 17/10/77 | R.C.M.P. and others accepted by SMNH seen again 17,19/10/ 77-10-13 |
| 33. Hafford,SK<br>52°,107°;42-9-W3 | 2 | 06/10/77 | P. Swifton confirmed by CWS on 07/10; 77-10-06 |
| 34. North Battleford,SK<br>52°,108°;44-15-W3 | 2 | 07/10/77 | K. Smith, STRR; 77-10-07 |
| 35. Neilburg,SK<br>52°,109°;46-26-W3 | 4:1 | 04/10/77 | H. DeVogel, confirmed by STRR, seen again 6,7,8/12, through 24/10, juvenile red band left leg, white band right leg; 77-10-02 |
| 36. Salvador,SK<br>52°,109°;38-25-W3 | 2(4) | 26/09/78 | K. Smith, STRR. One crane red band left leg, right leg aluminum, both seen about one week prior, joined about 30/09 by 2 more, all present until 04/10; 78-09-03 |
| 37. Muddy Lake,SK<br>52°,109°;38,39-22-W3 | 2 | 30/09/78 | A. Schmidt, STRR, not seen 01/10, possibly same birds as record 78-09-03; 78-09-05 |
| 38. Reward,SK<br>52°,109°;38-25-W3 | 2 | 12/10/78 | J. Stuart and others, Stuart reported confirmed by STRR; 78-10-05 |
| 39. Overflowing R.,MB<br>53°,101°;48-25-W1 | 1 | late 04<br>early 05 | R. Robertson, MRRTS; 77-05-01 |
| 40. Cumberland House,SK<br>52°,102°;57-2-W2 | 1 | 20/04/78 | R. Nabess, accepted by SNS; 78-04-02 |
| 41. Weirdale,SK<br>53°,105°;50-22-W2 | 2 | 21/08/77 | R. Brunt, STRR, also seen 22/08; 77-08-03 |
| 42. Witchekan Lake,SK<br>53°,107°;51-11-W3 | 1 | 22/09/78 | G. Cadieu, confirmed by STRR; 78-09-01 |
| 43. Edam,SK<br>53°,108°;50-20-W3 | 4 | 30/09/78 | K. Cowan, STRR, present about one week prior; 78-09-04 |
| 44. Dorintosh,SK<br>54°,108°;62-18-W3 | 2:1 | 13/10/77 | K. Murray, STRR; 77-10-11 |
| 45. Meadow Lake,SK<br>54°,108°;60-16-W3 | 5 | 26/04/78 | R. Tumbach, H. McKenzie, STRR; 78-04-04 |
| 46. Pierceland,SK<br>54°,109°;62-25-W3 | 2:1 | 15/10/77 | L. Payton, and others confirmed by STRR, seen again 06/10 p.m.; 77-10-04 |
| 47. Bonnyville,AB<br>54°,110°;61-7-W4 | 1 | 12/10/78 | R. Sabourin, accepted by CWS; 78-10-06 |

[1]N = “adults” reported, groups with juveniles indicated by ratio, unknown age reported shown as number followed by U.

TABLE 2. Unconfirmed sightings Whooping Cranes Prairie Provinces, 1977-78.

| | Location | Number[1] | Date | Observer remarks, CWS record |
|---|---|---|---|---|
| 48. | Kenosee Lake,SK<br>49°,102°;10-3-W2 | 2 | 01/09/77 | R. Behr, "flying"; 77014 |
| 49. | Torquay,SK<br>49°,103°;2-13-W2 | 14U | 25/04/78 | A. Lavalee, interviewed by STRR; 78012 |
| 50. | Hitchcock,SK<br>49°,103°;4-9-W2 | 3U | 13/04/78 | W. Eagles, investigated by STRR; 78004 |
| 51. | Osage,SK<br>49°,103°;11-13-W2 | 1 | 28/09/77 | K. Paslawski and others, received stale; 78007 |
| 52. | Goodwater,SK<br>49°,103°;4-13-W2 | 2:1 | 16/10/77 | Anonymous, received stale; 77049 |
| 53. | Ponteix,SK<br>49°,107°;10-11-W3 | 1 | 04/11/78 | H. Dickson, received stale; 78042 |
| 54. | Maple Creek,SK<br>49°,109°;11-26-W3 | 12 | 17/10/77 | D. Neely, received stale; 77051 |
| 55. | Broadview,SK<br>50°,102°;16-5-W2 | 4 | 30/08/77 | D. Francis, "flying"; 77013 |
| 56. | Broadview,SK<br>50°,102°;16-5-W2 | 1 | 11/10/77 | D. Wright, R. Richter, "went flying south"; 77045 |
| 57. | Bangor,SK<br>50°,102°;22-2-W2 | 9:1 | 21/09/78 | Mrs. J. Hilton, interviewed by CWS; 78026 |
| 58. | Odessa,SK<br>50°,103°;16-13-W2 | 3U | 09/04/78 | G. Curtis, interviewed by STRR; 78001 |
| 59. | Parkbeg,SK<br>50°,106°;18-31-W3 | 2 | 29/08/77 | I. Girling, "only stayed about an hour"; 77012 |
| 60. | Morse,SK<br>50°,107°;17-8-W3 | 1 | 08/09/77 | J. Burroughs, investigated by STRR, CWS, 3 occasions; 77018 |
| 61. | Lucky Lake,SK<br>50°,107°;23-10-W3 | 6 | 17/10/77 | K. Scott, received stale; 77053 |
| 62. | Hays,AB<br>50°,111°;13-13-W4 | 1 | 16/10/78 | M. McColl, received stale; 78043 |
| 63. | Ethelbert,MB<br>51°,100°;29-21-W1 | 5U | 11/04/78 | M. Dohan and others interviewed by MRRTS; 78003 |
| 64. | Margo,SK<br>51°,103°;33-10-W2 | 10 | 07/05/78 | V. & C. Lowey, investigated by STRR; 78019 |
| 65. | Wadena,SK<br>51°,103°;33-13-W2 | 3 | 04/09/77 | Mrs. H. D. Meyers, "flying"; 77016 |
| 66. | Semans,SK<br>51°,104°;28-21-W2 | 1 | 06/10/77 | R. Eddy, received stale; 77039 |
| 67. | Plunkett,SK<br>51°,105°;35-24-W2 | 5 | 25/04/78 | T. Grisdale, "flying"; 78013 |
| 68. | Venn,SK<br>51°,105°;31-24-W2 | 1 | 25/09/78 | L. Farago and others, received stale; 78032 |
| 69. | Nokomis,SK<br>51°,105°;28-23-W2 | 7:1 | 17/10/78 | R. Eddy, investigated by CWS; 78034 |
| 70. | Hawarden,SK<br>51°,106°;28-3-W3 | 1 | 30/09/77 | G. Kenege, received stale; 77030 |
| 71. | Glidden,SK<br>51°,108°;27-21-W3 | 4:3 | 29/09/77 | A. Oswald and friend, investigated by STRR; 77029 |
| 72. | Loverna,SK<br>51°,109°;30-28-W3 | 11:3 | 03/10/77 | H. Pyttlik, "flying" investigated by CWS; 77032 |
| 73. | Alsask,SK<br>51°,109°;28-29-W3 | 7<br>7 | 06/10/77 | E. Bernier, investigated by CWS; 77038 |
| 74. | Smiley,SK<br>51°,109°;31-25-W3 | 2U | 14/04/78 | H. Ternes, interviewed by STRR same birds reported present several days prior; 78006 |
| 75. | Chelan,SK<br>52°,103°;42-11-W2 | 2 | 30/04/78 | Mrs. Saunders, interviewed by STRR; 78016 |
| 76. | Annaheim,SK<br>52°,104°;38-20-W2 | 4 | 20/04/78 | A. Hoffman, received stale, "flying"; 78009 |

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|---|---|---|---|
| 77. Cudworth,SK<br>52°,105°;41-24-W2 | 1 | 16/09/77 | E. Lepp, received stale; 77022 |
| 78. Lake Lenore,SK<br>52°,105°;41-22-W2 | 2 | 23/09/77 | B. Pfeiffer, received stale; 77025 |
| 79. Bruno,SK<br>52°,105°;38-25-W2 | 12 | 25/04/78 | B. Seidel, “flying”; 78014 |
| 80. Prud'homme,SK<br>52°,105°;38-28-W2 | 7:1 | 23/10/77 | J. Seilski, received stale; 77059 |
| 81. Saskatoon,SK<br>52°,106°;36-6-W3 | 3 | 30/10/77 | J. Larson “flying”; 77059 |
| 82. Aberdeen,SK<br>52°,106°;39-2-W3 | 7U | 21/07/78 | Mrs. H. Jones and others; 78023 |
| 83. Speers,SK<br>52°,107°;45-12-W3 | 4 | 05/05/78 | C. Strautman and others, interviewed by STRR; 78018 |
| 84. Meath Park,SK<br>53°,105°;52-22-W2 | 4 | 05/09/77 | L. Desrocher, investigated by STRR, 2 field trips; 77017 |
| 85. Turtleford,SK<br>53°,108°;50-20-W3 | 4 | 23/09/78 | H. Ringrose, interviewed by CWS photographed, present for 4-5 days; 78029 |
| 86. Green Lake,SK<br>54°,107°;61-12-W3 | 3 | 01/08/78 | B. Sanregret, interviewd by APRW; 78024 |
| 87. Dorintosh,SK<br>54°,108°;62-19-W3 | 2:1 | 12/10/77 | J. Twidale and J. Chwelos, seen again 13/10, received stale; 77046 |
| 88. Meadow Lake,SK<br>54°,108°;60-19-W3 | 8 | 04/05/78 | G. Head, interviewed by STRR; 78017 |
| 89. Meadow Lake,SK<br>54°,108°;59-18-W3 | 7 | 21/10/78 | J. Dodds, “flying”, interviewed STRR; 78039 |
| 90. Flatbush,AB<br>54°,114°;2-66-W5 | 4U | 22/06/78 | S. Whitelock, interviewed by APRW; 78021 |
| 91. Flatbush,AB<br>54°,113°;65-26-W4 | 2 | ??/06/78 | S. Whitelock, interviewed by APRW; 78022 |

[1] Number = “adults” reported, groups with juveniles indicated by ratio, unknown age reported shown as number followed by U.

conclusive, the sighting was treated as unconfirmed. Reports were discredited if the biological characteristics of the bird described did not fit Whooping Cranes, other details of the sighting were incomplete, and the report could not be investigated.

When accepted, records were classified as new for the season, repeats, or an extension. Subsequent sighting of same number on different dates, additional numbers or the same numbers reported in adjacent locations were treated as extensions. The next legal township (36 mi² block, effectively about 25 km radius) was considered adjacent. Topographic maps scale 1:250, 000 were used to check described locations, legal land description and identify latitude and longitude of the sighting. Verbal description of location usually included a nearby town. If not, a town shown on a highway map was included in the record. The records were then tabulated by their estimated validity and location of sighting.

Sight records, in the form of raw data or summaries were forwarded periodically to contributing volunteers, museums, RCMP and wildlife management agencies in the Prairie Provinces, and selected officials in USFWS. Sightings of birds reported to Canadian Wildlife Service as Whooping Cranes resulted in 47 records which were accepted (Table 1) and 44 which could not be confirmed (Table 2). Twenty-three reports were discredited on the basis of incorrect or insufficient biological and/or site detail.

Locations of accepted and unconfirmed sightings in 1977 and 1978 follow a southeast to northwest dis-

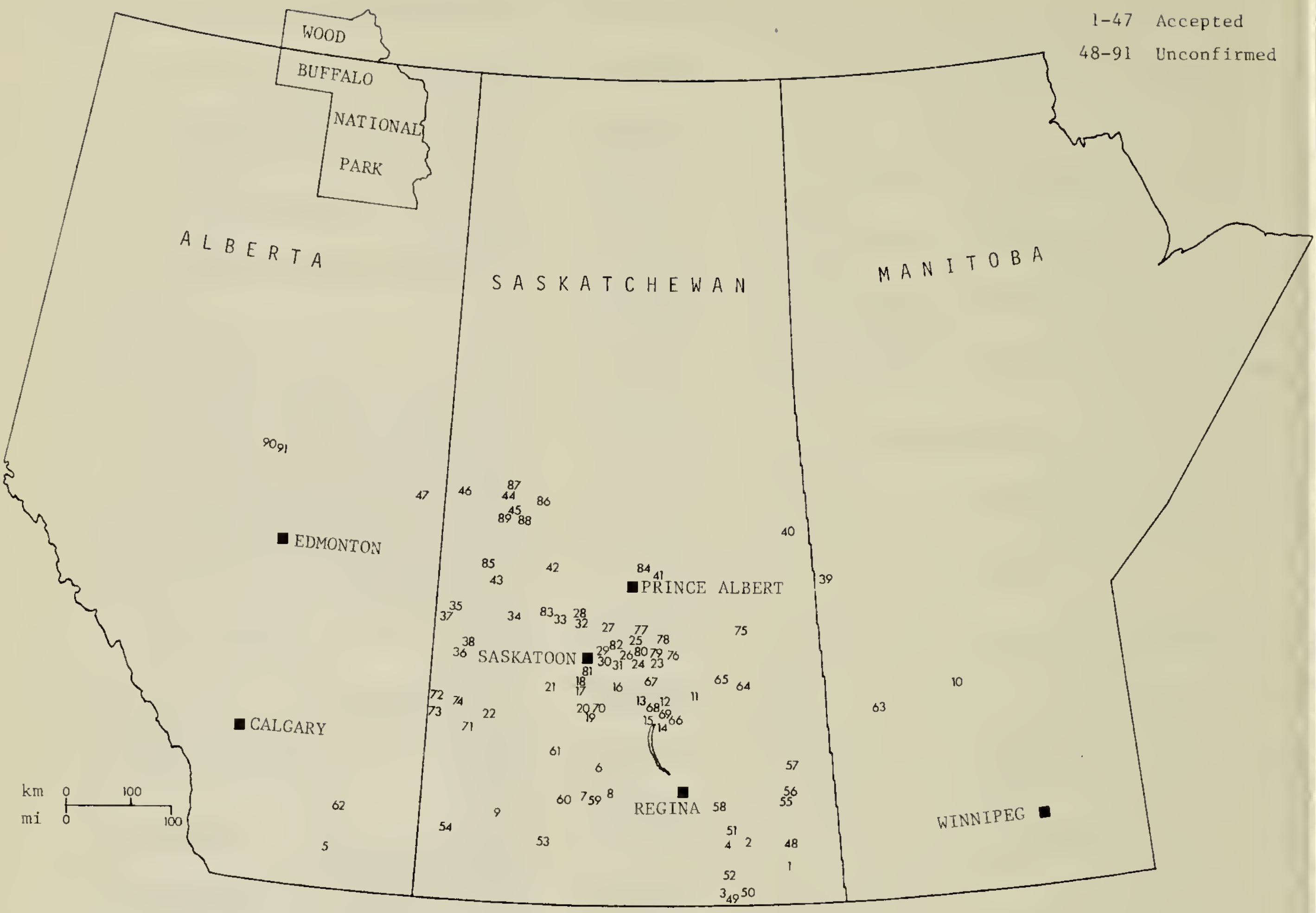

Figure 1. Whooping Crane Records — 1977-1978

tribution in Saskatchewan with aggregates near Weyburn, Saskatoon and Meadow Lake (Figure 1). Whatever the clusters may represent in terms of Whooping Crane migration ecology and behaviour, they reflect high likelihood of reported human encounters. This is important management information as it indicates where and when events occur, that may affect Whooping Cranes, at least to the extent they are reported.

The data presented here are limited. For example, only 14 family groups were reported out of 91 records. The earliest of those family groups was 26 September for an accepted record and 21 September unconfirmed. I would readily hypothesize that family groups are not seen in Saskatchewan until the third week of September. In 1978 none were reported at all. Chronology of migration provides important management information. Cumulative analysis of these data will provide insight for managers asking the questions of what to do, where, when and why? For those reasons as well as satisfying the willingness to share a free and rare human experience, sightings of Whooping Cranes in the Prairie Provinces should continue to be reported.

Reports should continue to be made as they have in the past, i.e., to the nearest official of a wildlife agency or a wildlife-related agency such as a provincial museum or local RCMP. The responsibility for summarizing the records has been assumed by CWS but we certainly can't do all the work of investigating and interpreting the records.

I want to thank all the volunteers who forwarded information on birds thought to be Whooping Cranes. I also thank J. B. Gollop for helping by personal acquaintance of volunteers and practical approach to tabulation and storage of the records. I owe special thanks to Brian Johns for checking tabulations against records and compilation of the map.

[1] McCOY, J. J. 1966. The hunt for the Whooping Crane: A natural history detective story. Lothrop, Lee & Shepard, New York. 223 pp. illus.

# LECONTE'S SPARROW IN SOUTHEASTERN BRITISH COLUMBIA

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All published British Columbia records of the LeConte's Sparrow are from the Peace River District[1] [2] (R. W. Campbell pers. comm.). In 1976, while conducting avian surveys along the Columbia River between Canal Flats and Edgewater, B.C., a small population of LeConte's Sparrows was discovered. At least four singing males were heard and observed, a description of which is on file at the B.C. Provincial Museum in Victoria.

The four birds were in wet sedge meadows surrounded with clumps of willows. Two birds were located near the junction of Horsethief Creek and the Columbia River on 8 June 1976 and the other two were observed on the Canadian Wildlife Service sanctuary near Wilmer on 9 June 1976.

These records are apparently not the first for southeastern British Columbia. Francis King (pers. comm.) first identified LeConte's Sparrows on her ranch near Golden in 1962. Since this initial observation, they have been recorded inconsistently in the ranch's hay meadows. Between 14 June and 11 July, 1977, she heard "maybe 4-5 birds" of this species. Rick Howie confirmed the observation.

In Kootenay National Park, a single LeConte's Sparrow was heard singing at Dog Lake on 27 May 1975.[4] On June 23, 1977, one was heard singing near Mount Fernie Provincial Park. (Van Tighem pers. comm.).

It appears that the LeConte's Sparrow is widely distributed but perhaps local along the Columbia Valley and possibly the Kootenay Valley from these records. The population appears small and restricted by the species' habitat preference.

McCaskie has summarized records of the LeConte's Sparrow in the far western United States.[3] These include three records from California, two from western Colorado, three from Utah, one from Idaho and one from Washington. All are west of the continental divide. With the exception of the Washington record for (29 May, 1964), all records are in the period of 28 September to 6 May suggesting either migrating or wintering birds.

Considering habitat, dates and the birds' singing behaviour, it appears likely that a small breeding population exists in the Columbia Valley.

All the LeConte's Sparrows observed along the Columbia River were on the river's flood plain where sedge meadows and agricultural hay meadows exist. Any man-induced changes that might affect water levels along this water course could have serious effects on this population, the only suspected breeding population of this species west of the continental divide.

[1] GODFREY, W. E. 1966. Birds of Canada. Nat. Mus. Can. Bull. 203.

[2] MUNRO, J. A., and I. M. COWAN 1947. A review of the bird fauna of British Columbia. B.C. Prov. Mus. Spec. Publ. No. 2. Victoria.

[3] McCASKIE, G. 1975. LeConte's Sparrow in California and the western United States. Western Birds 6:65-66.

[4] VAN TIGHEM, K. J. 1977. The avifauna of Kootenay National Park. Parks Canada, Radium, B.C. (unpublished).

# DOUBLE-BROODED YELLOW WARBLER?

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During the summer of 1978 I had the opportunity of observing a very interesting Yellow Warbler nest at Whyewold, Manitoba, on the north shore of Lake Winnipeg.

On 26 May I noticed a female picking up tiny pieces of discarded paper off a main sidewalk near a store. She flew into a honeysuckle bush, about 2.5 m high, at the edge of a Manitoba Maple hedge, 3 m in height, and wove this material into her nest.

When completed, the nest was a deep and bulky creation of plant fibres, bits of leaves, kleenex, fluffy cotton, paper and white string, and was built in the crotch of vertical branches of the honeysuckle. On 2 June as I passed, the female flew off the nest and I noticed two warbler eggs.

I observed the nest nearly every day but, because it was in such a vulnerable location (being on a lot next to a store, with cars and people coming and going), I was concerned that someone would tamper with the nest if I made my observations too obvious.

On 16 June I noticed the female feeding chicks and, on the 19th, could see movement among the downy chicks. I continued my daily observations and, on the eve of the 23rd, I noticed the nest was empty While standing still for a few moments, I saw both parents with food in their beaks when they flew into the hedge to feed the fledglings For several days thereafter I could hear the adults and the young in the hedge and surrounding trees.

I thought this was the end of all their nesting activity for the season but, on 7 July, I was very surprised to see a female warbler sitting on the same nest. Reasonable inference leads me to believe that the same pair of warblers decided to raise a second brood in this very same nest. There were three warbler eggs.

I visited the nesting area regularly and on 17 July I noticed one newly hatched chick and two Yellow Warbler eggs. I kept up my daily observations and on 27 July at 7 p.m. I found the nest empty; droppings were on the foliage of the honeysuckle bush, and I could hear the adults and fledglings in the hedge.

I have searched various authorities to see if a Yellow Warbler raises two broods during a season and in the same nest; I have been led to conclude that this particular nesting was a rare occurrence.[1, 2, 3, 4, 5]

In the fall I decided to take the nest to Mr. Herb Copland of the Manitoba Museum of Man and Nature, (because of the various materials used in its construction and because I had, by this time, discovered it was two-storied). He examined it carefully and wrote me as follows:

. . ."Through the thin bottom of the top nest I could faintly see a whitish object. By pushing the material in the bottom aside I found there was one brown-headed cowbird egg, one whole yellow warbler egg, and fragments of a second yellow warbler egg."

Further enquiries and discussions have led me to conclude that parisitism of the original nest (used for a second clutch) must have taken place sometime toward the end of June and/or beginning of July (when the female had decided to have a second brood and had laid two eggs in it.)

After the nest had been parasitized she then evidently decided to build a second storey on the nest and laid three eggs therein.

It would appear that the history of this nest is unusual in that:

1. First nesting was completed by 2 June with at least two fledglings.
2. A second nesting was attempted in the same nest, with two Yellow Warbler eggs; parasitized with one cowbird egg.
3. A second nesting was completed on 27 July with three fledglings.

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## COMMENTS ON THE WHYEWOLD WARBLER

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Jean Bancroft's Yellow Warbler nesting was indeed a rare occurrence. A wider search of the literature confirms its rarity in three aspects: second brood, same nest and nest construction.

While the observation cannot be accepted as irrefutable evidence of a second brood (because the bird was not marked), it may be the strongest evidence yet accumulated. The only other hint of more than one brood in a season comes from the Oneida Lake district of north-central New York: "Usually one brood is reared in a season, but we have some evidence to indicate two broods sometimes may be reared . . .".[10] While eggs have been found from May through June and into July, the usual explanation for such a long season is destruction of first nests or desertion of these due to cowbird parasitism.[11]

There is also a general reference as follows: "North American (warblers), with rare exceptions, rear only a single brood each year".[8] Among species breeding in the Prairie Provinces, the Yellowthroat is known to have two broods while the Yellow-rumped, Black-throated Green and Palm warblers may have.[4 9] However, even for these species, multiple broods may not occur as far north as our latitudes.

There are two pieces of evidence to suggest the rarity of second broods, both from Iowa. A study of marked birds found that Yellow Warblers could not be found in the vicinity of their nests more than 7 to 10 days after the young had left nor were the birds found to renest elsewhere.[7] The other observation is that this "was among the first warbler species to begin its southward migration. The easily recognized flight notes were heard at night and in early morning, as early as 18-19 June (1932). By early July they could be heard almost nightly, and in very early mornings the transients could be seen flying over or dropping from considerable height to alight in bushes and trees".[12]

This may be the first example of a Yellow Warbler's nest being used twice in a season. None of the authorities listed below suggest it and the situation probably applies to many species as the following indicates: "Among passerine birds, as well as many other groups, it is exceptional for pairs to renest in the same nest or at the same nesting site".[6]

Finally, the use of paper in a Yellow Warbler nest may not have been reported previously. The use of any man-made material is apparently unusual. Wool and cotton have been found in nests but these may have been natural or processed.[1] [3] The only other artificial material mentioned was "a piece of string".[5]

The Whyewold warbler, however, was not unique in covering cowbird eggs. The Yellow Warbler may be the only species that does this, although more than 200 other species are parasitized by Brown-headed Cowbirds.[2] The record is held by a bird that built a six-storey nest, each storey having a cowbird's egg.[1]

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# SMALL MAMMALS IN ASPEN CLEARCUTS

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Small mammals are an important part of the trembling aspen *Populus tremuloides* forest ecosystem. An understanding of the reaction of these animals to alteration of their habitat through clearcut logging is valuable knowledge that can be added to the growing amount of information about the effect of logging on wildlife species.

Approximately 1,400 ha (3,500 acres) of mature aspen forest in the Pasquia-Porcupine region of Saskatchewan (Fig. 1) are clearcut annually for the production of waferboard. Research into the effect of this clearcutting on wildlife population has been ongoing for the past several years but most of the effort has been directed toward the resident big game species. This preliminary study of small mammal populations on the clearcuts and in the adjacent mature forests was conducted in an effort to obtain a more complete knowledge of the ecological effects of forest cutovers.

## Study Area

Small mammal trapping was carried out in three locations in the Piwei cutting block in the Porcupine Provincial Forest about 55 km southwest of Hudson Bay, Saskatchewan (Fig. 1). The Piwei cutting block is a series of recent clearcuts (< 10 years old) in the mature aspen stands characterizing this area. Some mixedwood stands (aspen - white spruce *Picea glauca*) and pure softwood stands are also found in this locale.

### TRAP AREA A

This trap area consisted of a 3-year-old cutover and adjacent mature aspen forest. In the three years since logging, aspen suckering had resulted in a dense stand of aspen approximately 2 m high overtopping a shrub layer of beaked hazelnut *Corylus cornuta* and a modest herb stratum. Tops of numerous felled trees had been left in the cutover as slash.

The adjacent mature stand had an aspen - balsam poplar *Populus balsamifera* overstory about 20 m high with a canopy density of 80-100 percent. The shrub stratum under this canopy consisted of moderate amounts of high-bush cranberry *Viburnum trilobum*, beaked hazelnut and speckled alder *Alnus rugosa*; the ground cover was primarily leaf litter.

### TRAP AREA B

This trap area consisted of a 1-year-old cutover and the adjacent mature forest. The cutover was characterized by aspen sprouts about 0.5 m high and a limited herb stratum; total ground cover was approximately 50 percent. Tops of the aspens removed during logging dotted the cutover.

The mature stand, situated at the top of the Piwei River valley, was on terrain with a slope of about 20°. Over-story was 20 m high aspen and the moderately dense shrub understory was composed primarily of beaked hazelnut. Ground cover was mostly leaf litter and bunchberry *Cornus canadensis.*

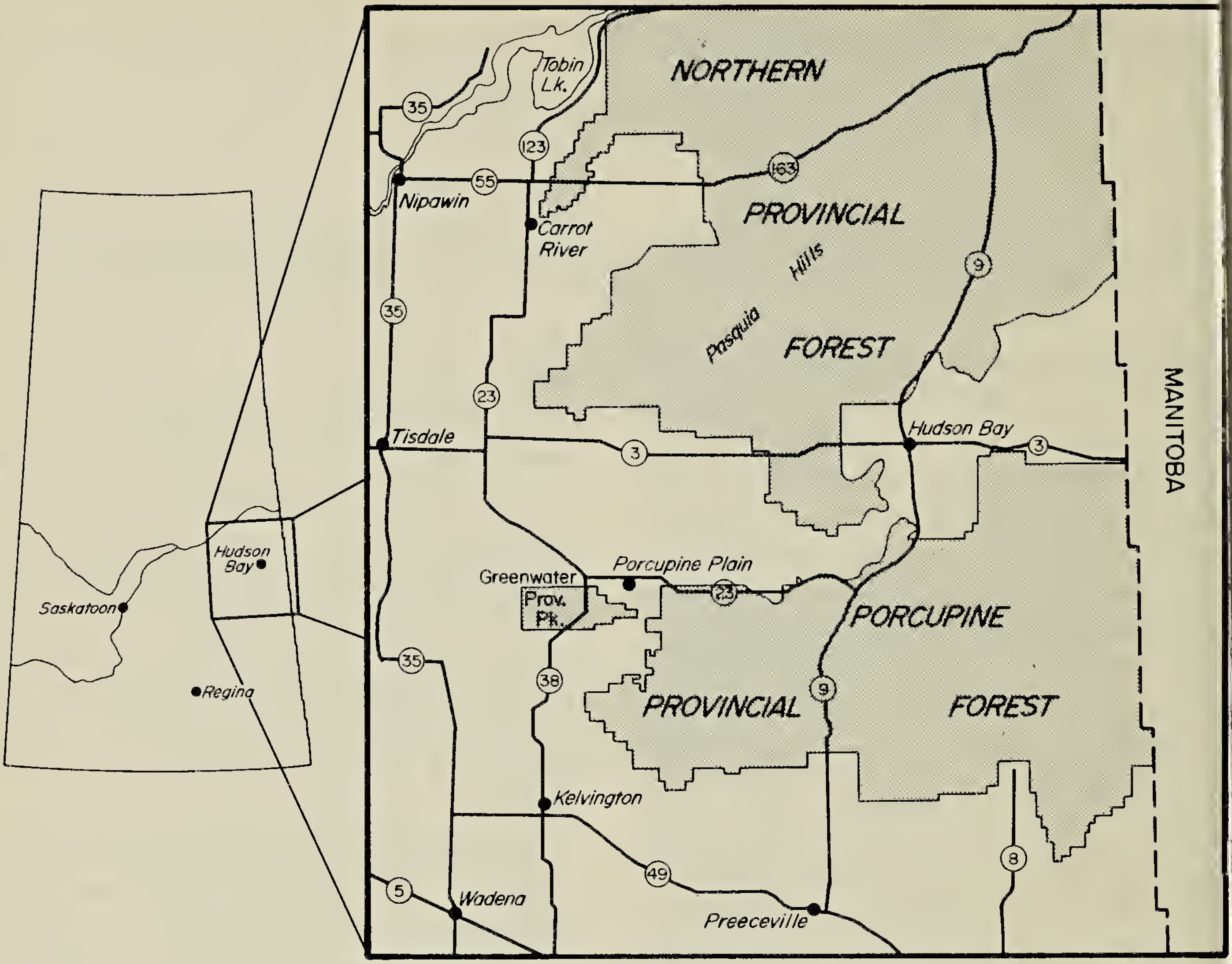

*Figure 1. The Pasquia - Porcupine region of Saskatchewan.*

TRAP AREA C

This trap area consisted of a 3-year-old cutover and adjacent uncut forest. Before logging, the portion of the cutover in which the trapping took place had a white spruce component overtopped by the aspen canopy. This spruce stratum was left when the aspen was removed and some of the trees had subsequently blown down. The cutover was a tangle of fallen spruce, aspen tops and limited amounts of sprouting aspen. Ground vegetation varied from moderate amounts of forbs and grasses under the sprouting aspen to dense stands of grasses and sedges *Carex* spp. in the spruce-dominated parts of the trap area.

The uncut stand adjacent to the cutover was a mixed aspen — white spruce stand with the aspen overtopping the spruce. The shrub stratum was sparse and principal ground cover was leaf litter, particularly in those portions where spruce predominated.

## Methods

On each of the three trap areas, two lines of 30 snap-traps each were employed; one line was located on the cutover and one line in the adjacent mature forest. Three traps were set at each station with about 10 m between stations resulting in a 10-station trap line about 100 m in length. Trapping on each area took place on two consecutive nights yielding a total of 60 trap-nights per line and 120 trap-nights per area. Traps were baited with peanut butter and checked every 24 hours.

TABLE 1. Small Mammals Captured (Number per 100 trap-nights) on the three trap areas.

| | TRAP AREA A | | TRAP AREA B | | TRAP AREA C | |
|---|---|---|---|---|---|---|
| Species | Mature Forest (60 TN)* | Cutover (60 TN) | Mature Forest (60 TN) | Cutover (60 TN) | Mature Forest (60 TN) | Cutover (60 TN) |
| *Clethryonomys gapperi* | 13.3 | 31.7 | 15.0 | 26.7 | 8.3 | 36.7 |
| *Peromyscus maniculatus* | 1.7 | 8.3 | 8.3 | 5.0 | 1.7 | 3.3 |
| *Microtus pennsylvanicus* | — | — | 1.7 | 1.7 | — | 5.0 |
| *Sorex cinereus* | 3.3 | 1.7 | — | — | — | — |
| *Blarina brevicauda* | — | 1.7 | — | — | — | — |
| Total | 18.3 | 43.4 | 25.0 | 33.4 | 10.0 | 45.0 |

Number of trap-nights (TN) in each area.

Trap area A was trapped 1 and 2 September, 1977; trap area B was trapped 12 and 13 September, 1977 and trap area C was trapped 13 and 14 September, 1977.

## Results

Small mammal numbers for the three trap areas expressed as the number of individuals captured per 100 trap-nights are presented in Table 1. Red-backed voles *Clethryonomys gapperi* were the most frequently trapped animals (79 individuals in 360 total trap-nights) and deer mice *Peromyscus maniculatus* were the second most frequent (17 individuals). Meadow voles *Microtus pennsylvanicus*, masked shrews *Sorex cinereus* and short-tailed shrews *Blarina brevicauda* were captured infrequently with trap totals of 5, 3 and 1, respectively. Small mammal nomenclature follows Banfield.[2]

The possibility of differential trap success accounting for some of the differences in trap area capture totals (catch/effort, Table 1) was examined using Nelson and Clark's[10] equation for determining the influence of sprung traps on catch/effort (CE) calculations (Table 2). Apparently, little bias due to sprung traps occurred as the corrected CE values (Table 2) were in approximately the same relative proportions as the capture totals (Table 1).

In each trap area, small mammal capture totals and CE were greater in the cutovers than in the mature or uncut stands. The total number of small mammals captured and CE on the cutover portions of the three trap areas were least in the youngest cutover (trap area B, one year old) whereas the trap totals and CE in the older cutovers (three years old) were larger and similar in both. Small mammal capture totals and CE in the uncut portions of the trap areas were highest in trap area B, lowest in trap area C and intermediate in trap area A.

Capture totals and CE for red-backed voles in the uncut areas were similar in trap areas A and B but only

TABLE 2. Catch/Effort with Correction for Sprung Traps.

| | CE (%) TRAP AREA A | | CE (%) TRAP AREA B | | CE (%) TRAP AREA C | |
|---|---|---|---|---|---|---|
| Species | Mature Forest | Cutover | Mature Forest | Cutover | Mature Forest | Cutove |
| *Clethryonomys gapperi* | 18.4 | 48.1 | 18.8 | 33.0 | 9.4 | 51 |
| *Peromyscus maniculatus* | 2.3 | 12.7 | 10.4 | 6.2 | 1.9 | 4 |
| *Microtus pennsylvanicus* | — | — | 2.1 | 2.1 | — | 7 |
| *Sorex cinereus* | 4.6 | 2.5 | — | — | — | — |
| *Blarina brevicauda* | — | 2.5 | — | — | — | — |
| All Species | 25.3 | 65.8 | 31.3 | 41.3 | 11.3 | 63 |

about half those levels in trap area C. Deer mouse captures and CE in the uncut areas were similar in trap areas A and C but much higher in trap area B. The only masked shrews trapped in the uncut portions were caught in trap area A.

In the cutover portions of the trap areas, red-backed voles were trapped most frequently in trap areas A and C and least frequently in trap area B. Trapping frequency of deer mice was highest in trap area A and lowest in trap area C. The largest capture of meadow voles occurred in the cutover portion of trap area C. The only masked shrew and short-tailed shrew captured in a cutover were trapped in area A.

## Discussion

Higher capture totals and CE for small mammals on the cutovers as compared to the adjacent uncut stands indicates clearcut logging improved the habitat of aspen-dominated areas for small mammals. Increases in small mammal populations after logging have been documented in studies of Douglas-fir *Pseudotsuga menziesii* forests in California and Oregon[13, 3] and har wood and boreal coniferous forest in West Virginia,[6] wherea population densities have remaine more or less constant after loggin upland black spruce *Picea marian* stands in Ontario[9] and hardwoo forests in New York.[8]

A simplified explanation of i proved habitat after logging woul be greater availability of food an cover. The cutover portions of th three trap areas had a ground cove of herbs, low shrubs and loggin slash that was generally superior a small mammal habitat, even in the 1 year-old cutover, to that of the uncu portions. Several authors[13, 1, 3, 7] hav described the food of deer mice a consisting primarily of seeds and in sects and the food of red-backe voles as mostly succulent plant part and some seeds. The rapid recover and proliferation of the vegetation i the aspen clearcuts of the three tra areas presumably resulted in in creased food supplies, particularl for red-backed voles, and bette cover conditions than were availabl in the uncut stands. Lower trap total and CE for the cutover portion of tra area B than for the other two cutover trap areas were probably because the short interval since logging (one year) limited vegetative recovery in the cutover resulting in habitat conditions inferior to those in the 3-year-old cutovers. However, habitat conditions in the 1-year-old cutover were still superior to those of the uncut stands.

Capture totals and CE for the uncut portions of the three trap areas indicated the mixedwood stand (trap area C) had the lowest small mammal population, presumably because the sparse ground cover under this stand provided poor food and cover conditions. The uncut portion of trap area B may have been better small mammal habitat than the uncut portion of trap area A because of denser shrub and herb layers.

The most noticeable change in the small mammal population following clearcutting was in the density rather han composition. Apparently, both uncut and clearcut habitats were best for red-backed voles as they made up the major proportion of the small mammal populations in each habitat. Deer mice, trapped in low proportions in both the clearcuts and uncut areas, must have been limited n the hardwood-dominated areas. he lack of change in population composition after logging is contrary o the findings of studies of small mammals after logging Douglas-fir orests,[13] [3] [4] black spruce forests,[9] ack pine *Pinus banksiana* forests in Manitoba[12] and mixed conifer-ardwood forests in Minnesota.[7] hese studies reported a decrease in ed-backed voles and an increase in eer mice after clearcutting, likely as result of a lack of cover making the learcuts unsuitable for red-backed oles. The rapid vegetative recovery f the aspen cutovers in this study robably meant the period when a ack of cover was limiting red-backed

*Deer mouse* *Wayne Lynch*

voles had already passed by the end of the first complete growing season after clearcutting. Because the vegetative composition of recent aspen clearcuts closely resembles that of mature aspen stands,[5] major changes in the small mammal population composition would not be expected.

Meadow vole capture totals were highest in the cutover portion of trap area C characterized by extensive grass and sedge cover. Martell and Radvanyi[9] felt meadow vole microdistribution and density were correlated to the amount of moist, graminoid cover present. Banfield[2] describes the typical habitat of masked and short-tailed shrews as moist forests; the few individuals of these species captured during the study were trapped on trap area A, the moistest of the three trap areas.

Numerous studies have demonstrated the role of small seed-eating mammals in hindering regeneration of coniferous trees of commercial importance (see Pank[11]). In particular, mice have been found to be partly responsible for natural seeding failure after logging or fires and they often make artificial seeding difficult or impossible. Because aspen regenerates after logging or fires primarily by suckering from the existing root system, seed-eating small mammals are probaby of little importance in affecting revegetation of aspen cuts or burns. However, small mammals could conceivably affect regeneration of white spruce after logging mixedwood stands like that characterizing trap area C.

Although small mammals in an aspen-dominated forest habitat do not appear to be of direct economic importance to man, they are an integral part of the food chains or webs that characterize all biotic communities. In simplified terms, producers (plants) in the aspen community are eaten by primary consumers (herbivores such as red-backed voles and deer mice) which are in turn eaten by the secondary consumers (carnivores) such as red-tailed hawks, broad-winged hawks, short-tailed weasels and coyotes. Through these interrelationships of the food web in the aspen forest, small mammals can directly and indirectly influence the floral and faunal characteristics of the community to a significant degree.

## Acknowledgements

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# NOTES ON THE DISTRIBUTION OF BATS IN ALBERTA AND SASKATCHEWAN.

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Ranges of nine species of bats found in Alberta and Saskatchewan are reviewed, new locality records of Keen's bat (*Myotis keenii*) and long-egged bat *(Myotis volans)* are recorded. Bat observations of value ikely to be made by non-professionals are outlined.

## Introduction

Bats are among the poorest known of mammals found in the provinces of Alberta and Saskatchewan. Inspection of any substantial collection from the two provinces is almost certain to turn up a few range extensions and other useful information. The range records presented here are based on bats submitted to the Animal Diseases Research Institute (Western) at Lethbridge, Alberta for rabies testing (suspect bats), bats captured by the writer (survey bats) and bats in museum collections. As an aid to naturalists who may wish to consult museum collections locality records are identified as to the museum in which specimens are tored (Fig. 1). University and provincial museums all have examples of he most common species. A few pecimens in collections may not be oted as an exhaustive search was ot undertaken.

Non-professional naturalists have made a considerable contribution to he study of bats, particularly in the rovince of Saskatchewan; much of he knowledge of birth dates of hoary bats and early knowledge of silver-haired bats are due to observations by non-professionals. It is, however, highly desirable that observations of bats by amateurs be supported by professional opinions as mistakes are made even by experts and there is always the possibility of a species being found outside its usual range. Identification of some bat species is difficult, however, identification of some of the most interesting is relatively easy. Familiarity with the difficult species soon makes identification of these comparatively easy.

Following are brief descriptions of the ranges of bats known to occur in Alberta and Saskatchewan and comments on abundance and gaps in our knowledge which are most likely to be filled by non-professionals. It is hoped that this material will aid those who have made, or will make, observations of bats to determine the value of these observations. Staffs of the provincial museums of Alberta and Saskatchewan and the writer are always interested in information concerning bats. Of particular interest are reports of bats in caves or mines or bats flying about the entrances to these, bats with young or young bats in trees or other natural situations, several bats at once in a building in winter, large numbers of bats in a building during late August and September, and bat colonies in mountainous and badlands areas.

## Species Accounts

LITTLE BROWN BAT *(Myotis lucifugus)* — Little brown bats are the most abundant bats in Alberta and Saskatchewan, they are the species most frequently found colonizing attics and eaves and are to be expected everywhere except in certain areas of extensive prairie. Preliminary examination of the summer distribution and behavior of this species in Alberta have been made.[15] Virtually nothing, however, is known of winter habits and migration. Little brown bats require cool, moist environments to hibernate and a few are known to hibernate in caves near Nordegg, Cadomin and in Wood Buffalo National Park in Alberta and in a mine near Estevan in Saskatchewan.[9] The hibernating population of these caves totals near 2,000; a tiny fraction of the several million which undoubtedly occur in the two provinces. Reports of bats in caves or mines or bats flying about the entrances to these are therefore of considerable interest.

BIG BROWN BAT *(Eptesicus fuscus)* — Survey and rabies-suspect big brown bats have been found widely over the southern half of Alberta and Saskatchewan (Fig. 1). If submissions for rabies testing are a reliable indicator substantial summer and winter populations exist in the cities of Saskatoon, Medicine Hat and Lethbridge where it is likely the most common bat species. The distribution of the species in the northern portion of the provinces is poorly known. A rabies-suspect individual from Peace River is the only record for that region, although there is a record of a colony from adjacent British Columbia; it is probably a relatively scarce resident of the region.[3] Soper collected a specimen in Wood Buffalo National Park and a number of the species were observed hibernating in a cave there by the writer.[17] Big Brown bats are relatively sedentary and may be largely confined to areas with caves suitable for hibernation in northern regions.[6]

Evidence of hibernation by big brown bats in buildings in Regina and Battleford has been known for some time, and is thought to be general for the species.[9] [16] [6] The number of suspect and survey big brown bats found in buildings in winter indicate that most of the species hibernates in buildings on the prairies despite the finding of Nero of a few hibernating in a mine near Estevan.[9] It is likely that settlement of the prairie provinces may have resulted in a considerably increased population of big brown bats in response to the new habitat provided by buildings and mines.

SILVER-HAIRED BAT *(Lasionycteris noctivagans)* — Silver-haired bats are common migrants over the heavily settled areas of the two provinces where they are frequently encountered hanging on buildings during late August and early September.[7] [13] Despite this abundance the only records of young or lactating females are from Buffalo Narrows and Peace River.[12] [14] Records of bats with young or the young of this and other species in trees and other natural locations are of considerable interest.

HOARY BAT *(Lasiurus cinereus)* — Hoary bats have not been collected from much of northern Saskatchewan and Alberta, however occurrences at Fort Resolution, N.W.T and in the Peace River region of Alberta suggest that the species is to be found throughout the provinces although it is unlikely that it is anywhere common there.[1] [13]

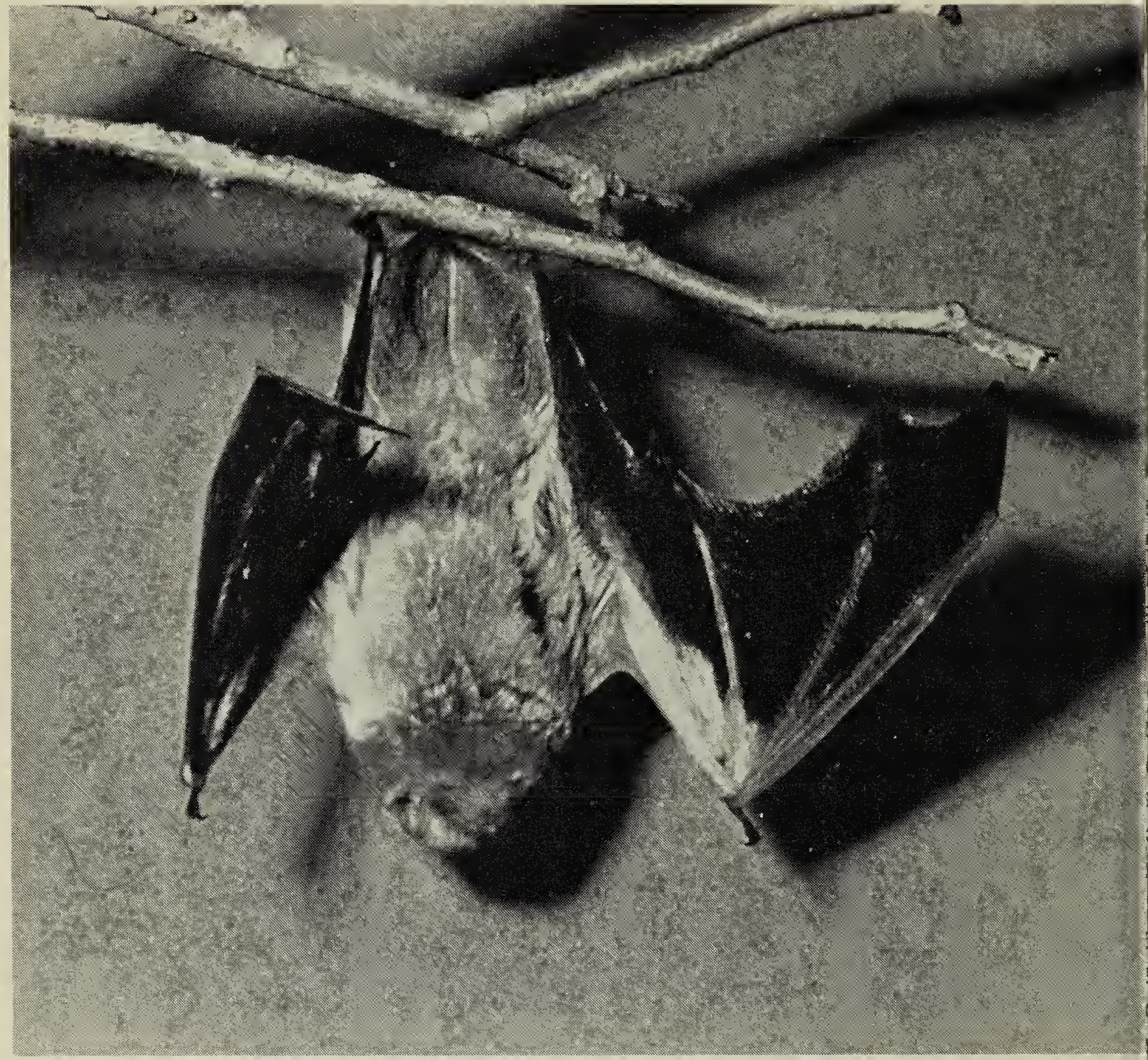
Birth takes place in late June. Females and young are mos

ig brown bat

Robert J. Long

requently located in trees or oc-asionally on the ground, as the emale is unable to carry the young s they become larger. Birth ocations (based on pregnant emales, females with young and mall young) have been documented t a number of localities in southern askatchewan and Alberta (Fig. 1), urther records are needed, however.

Hoary bats are considered to be long distance migrators.[2] Little, however, is known of the details of their movements. Captures of Hoary bats in Saskatchewan and Alberta (Table 1) are most frequent in late August, suggesting that a movement of this species across the southern area of these provinces takes place at this time. Considerable evidence



*Red bat* *Fred W. Lahrma*

of separation of the adult sexes during the summer is available in the United States. This is likely the case in the prairies as only 2 of 18 adult hoary bats of known sex examined were males.[2]

RED BAT *(Lasiurus borealis)* — Red bats are widely distributed over Saskatchewan and a considerable number are to be found in collections. There are only two records of the species in Alberta. The species is known for wandering in the late summer and fall.[2] Information on, and analysis of, the timing of the occurrence of the species and birth records are needed.

KEEN'S BAT *(Myotis keenii)* — Keen's bats have only recently bee identified from Alberta (van Zyll d Jong pers. comm.) and only on record is published from Saskatchewan.[12] The species is widel distributed in northern and centra Alberta (Fig. 1) and is probabl similarily distributed in Saskatchewan. All the records, excep those from Cadomin, are of singl bats. The 10 captured at Cadomi constituted less than 1% of the bat captured there as do the 3 capture in and around Edmonton suggesting that the bat is comparatively rare in central Alberta. Th

TABLE 1. Distribution of dates of 51 captures of hoary bats from Alberta and Saskatchewan.

| | June | | July | | August | | September | | October | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1-15** | **16-30** | **1-15** | **16-31** | **1-15** | **16-31** | **1-15** | **16-30** | **1-15** | **16-31** |
| No. Captures | 5 | 3 | 2 | 6 | 6 | 24 | 1 | 3 | 0 | 1 |

species evidently makes up a larger proportion of the northern bat population. Two were among the relatively few bats from the Peace River Region, a specimen is the only bat submitted from the area of High Level and one of nine bats from a hibernaculum in Wood Buffalo Park was a Keen's bat.

LONG LEGGED BAT *(Myotis volans)* — Schowalter and Dorward noted the occurrence of long-legged bats along the Milk River.[13] Since that time the writer has captured sufficient numbers of this species to indicate that it is of regular occurrence f not common there. Additional records are of a long-legged bat from a cabin in Waterton, from which a bat colony had been excluded the previous summer, southwest of Lethbridge and 185 captured by the writer at Cadomin Cave and Wapiabi Cave near Nordegg) in 1978. Thirty-eight were captured one night at Cadomin Cave.

The occurrence of this species in numbers along the Milk River and the existence of an apparently isolated population in North Dakota indicate that long-legged bats may occur in southern Saskatchewan.[5]

SMALL-FOOTED BAT *(Myotis leibii)* — A considerable number of small-footed bats from a number of localities have been captured in Alberta along arid river valleys in the south. The species is undoubtedly more widespread and abundant in Saskatchewan than the known localities (Fig. 1) suggest. Suitable habitat is to be found along the Battle River in Alberta and the species may be found there.

LONG-EARED BAT *(Myotis evotis)* — Long-eared bats have been found

*igure 1. Specimen location or source.*

1. National Museum of Natural Sciences, Ottawa
2. Royal Ontario Museum, Toronto
3. Provincial Museum of Alberta, Edmonton
4. Zoology Museum, University of Alberta, Edmonton
5. Biology Museum, University of Saskatchewan, Saskatoon
6. National Museum of Natural Science, Washington, D.C.
7. Museum of Natural History, Regina
8. Survey bats (not collected)
9. Suspect bats (not collected)
0. Jones[4]
1. Soper[17]
2. Nero[10]
3. Nero[11]
4. Anderson[1]

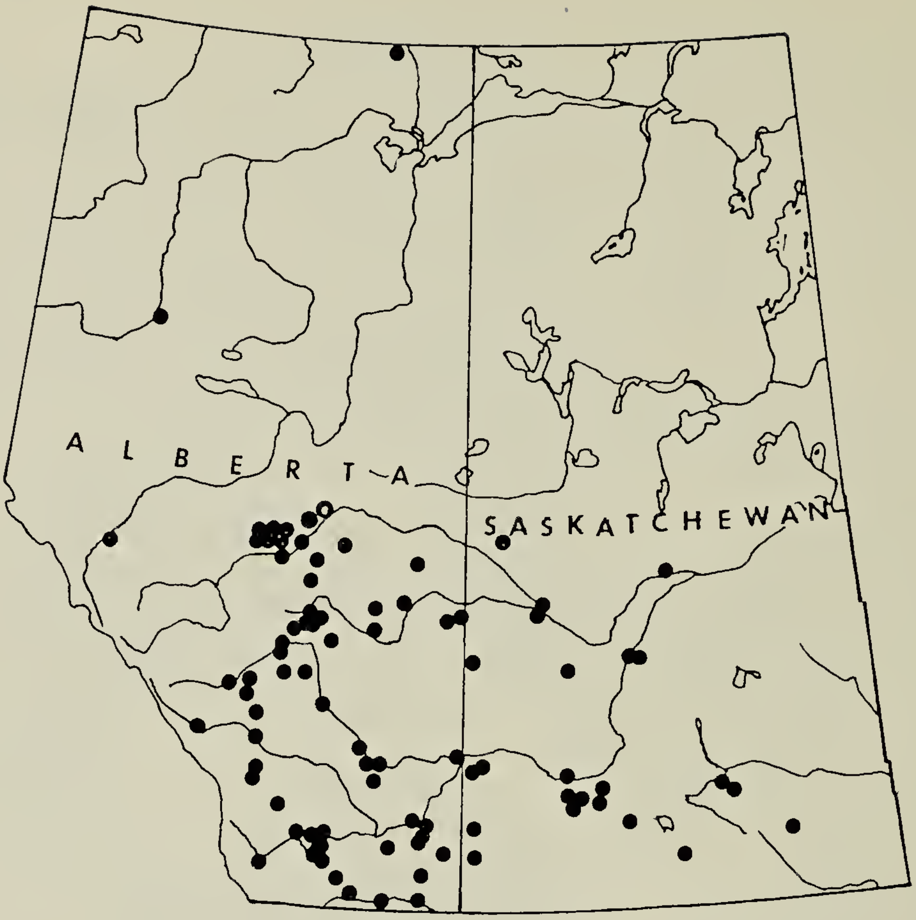
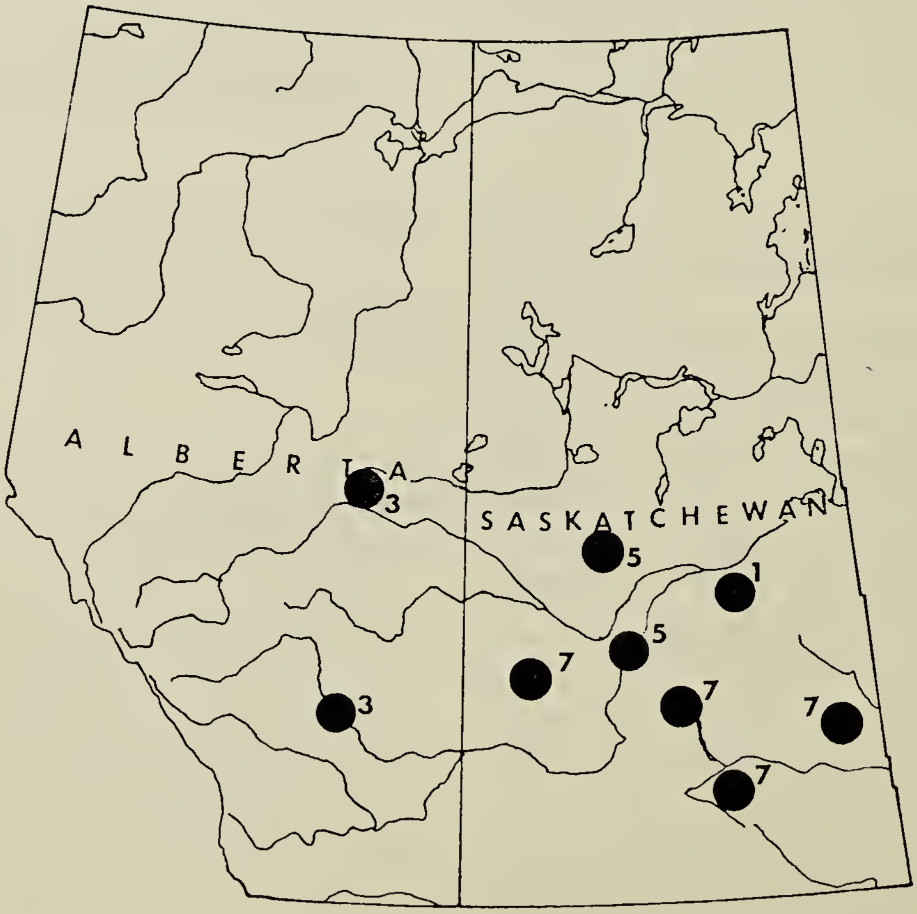


*Figure 1a. Localities of suspect and survey big brown bats from Alberta and Saskatchewan: 1972-1978.*

*Figure 1b. Probable birth locations (based on findings of pregnant females, females with young, and small young) of hoary bats.*



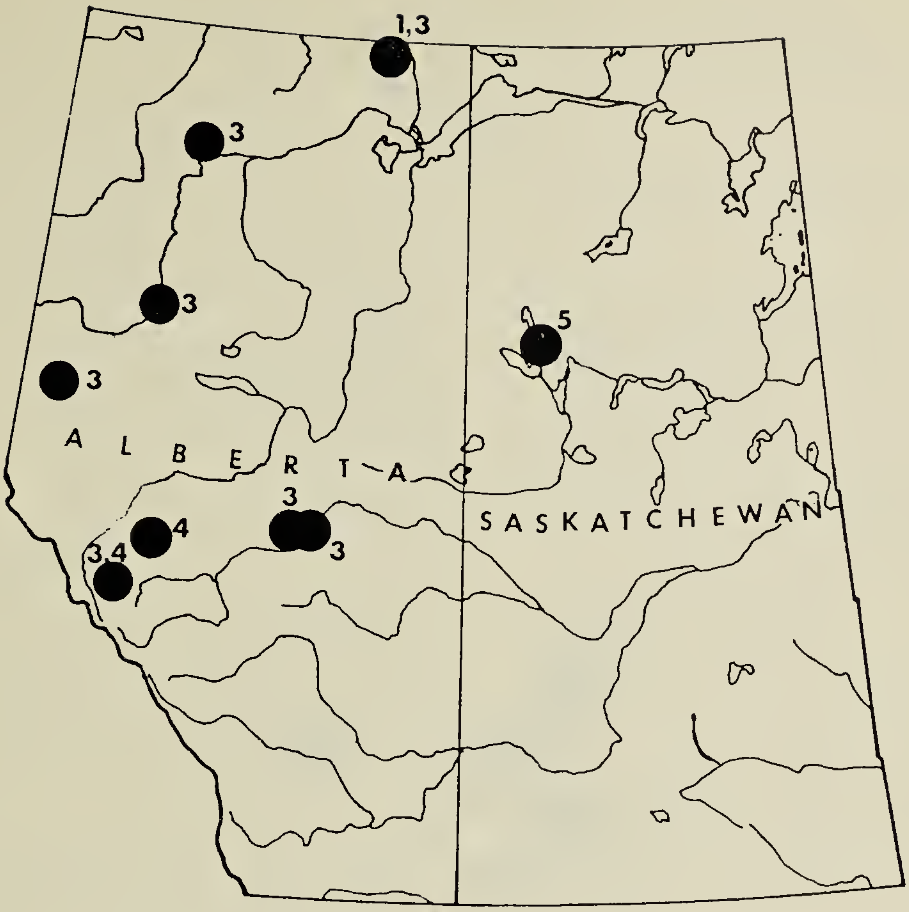
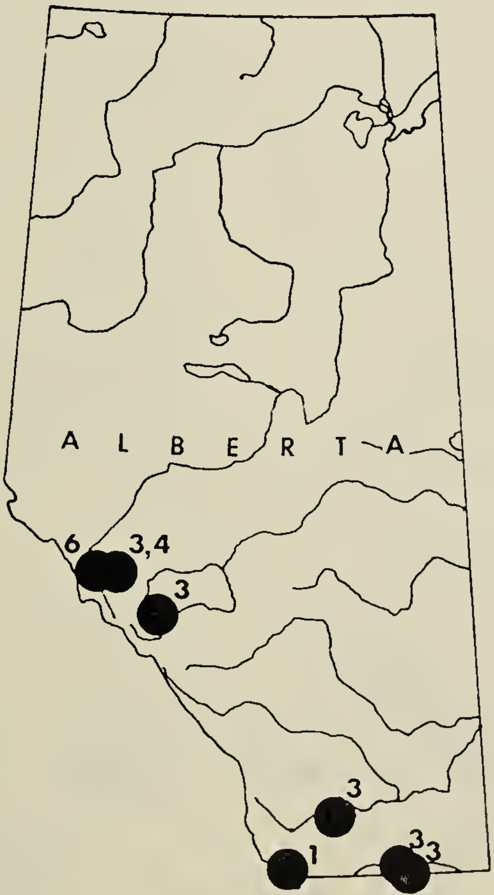


Figure 1c. Capture localities of Keen's bats in Alberta and Saskatchewan.

Figure 1d. Capture localities of long-legged bats in Alberta.



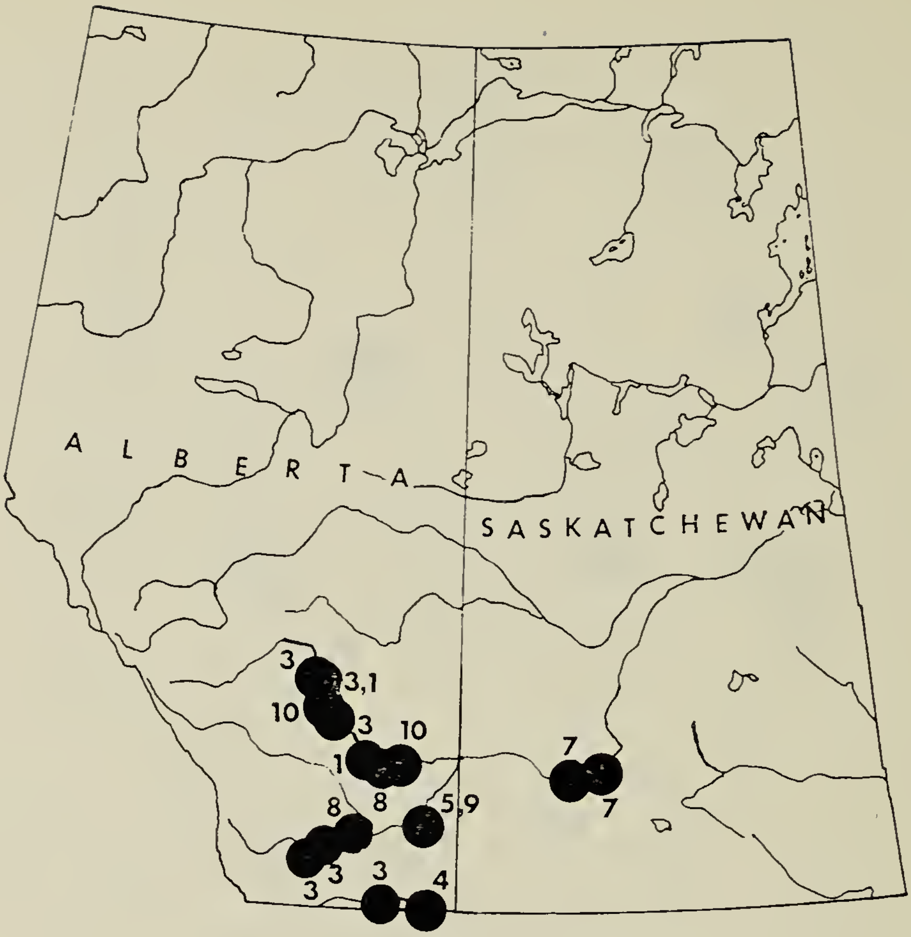
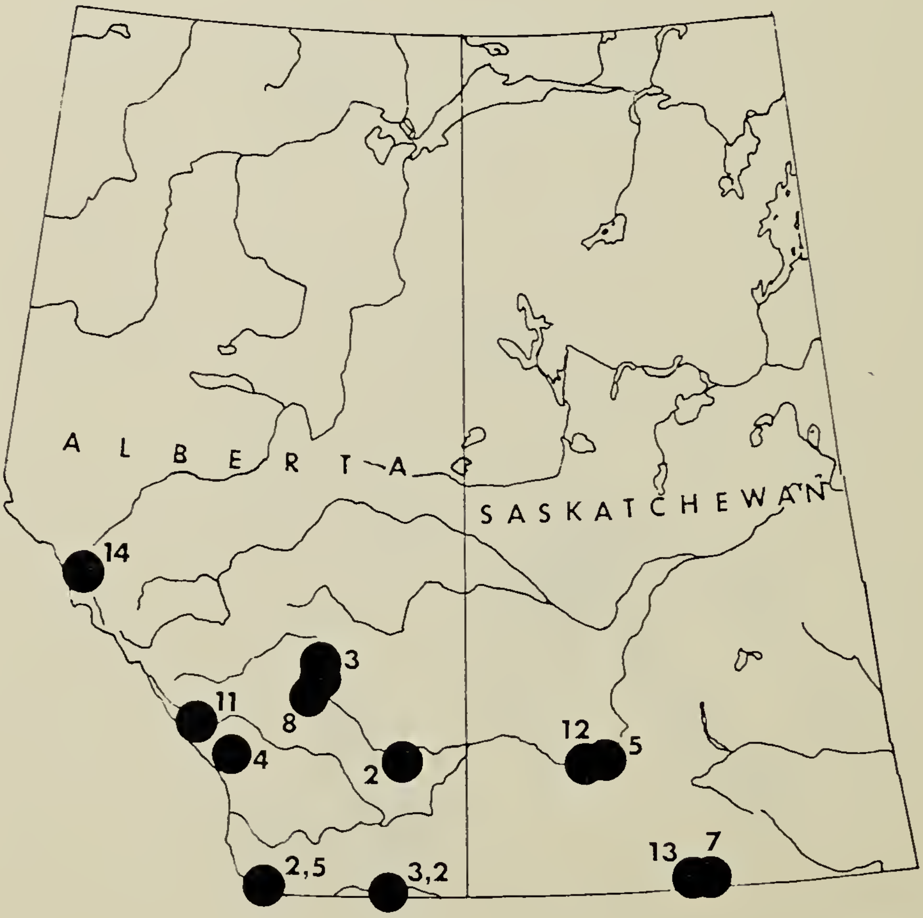


Figure 1e. Capture localities of small footed bats in Alberta and Saskatchewan.

Figure 1f. Capture localities of long-eared bats in Alberta and Saskatchewan.



throughout the mountain and badland regions of Alberta and Saskatchewan (Fig. 1). The species s known to be common only in the areas west and north of Drumheller, t is otherwise known only from solated occurrences.[13] The species orms colonies in buildings and bat colonies in buildings in mountainous areas or along arid river may be of his species and are of considerable nterest.

## Acknowledgements

The research described here was argely funded by the Veterinary Services Division of the Alberta Department of Agriculture through Dr. H. Vance and G. Whenham. Dr. J. Bradley and staff of the Animal Diseases Research Institute contributed continued cooperation. Dr. . Storer, Natural History Museum of Saskatchewan; Dr. J. Iversen, University of Saskatchewan, Saskatoon; Dr. V. Lewin and Mr. W. Roberts, University of Alberta; Mr. H. Smith, Provincial Museum of Alberta; Dr. Peterson, Royal Ontario Museum; Dr. C. van Zyll de Jong, National Museum of Natural History; and Dr. M. Bogan, American Museum of Natural History, provided access to, or information from, collections at their respective nstitutions. Parks Canada and the Alberta Parks Division provided permits to capture bats in parks. Others have contributed in numerous ways. Outstanding of these are Messrs. J. Gunson, L. Harder and N. Previsich and the Naturalist staff of Wood Buffalo National Park.

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## THE RARE VASCULAR PLANTS OF SASKATCHEWAN

ROBERT V. MAHER, GEORGE W. ARGUS, VERNON L. HARMS and JOHN H. HUDSON. 1979. Syllogeus #20, National Museum of Natural Sciences, Ottawa K1A 0M8. Free.

This book lists 368 species (in 60 vascular plant families) which have been reported as rare. One appendix lists additional species which have been reported as rare but which are unconfirmed or misidentified or which seem to be too widespread and abundant to be included in this list. The text includes preface, general comments, acknowledgements, bibliography and appendices (about 25 pages) as well as the annotated list (about 30 pages) of rare plants. Between the English and French texts there are 25 pages showing 300 maps of the province clearly indicating where herbarium specimens of most of the rare species have been collected.

Some plants are rare because plant migration is generally a slow process and less than twelve thousand years ago much of Saskatchewan was still covered by glaciers. Obviously the status of a species is constantly changing and a list of rare plants of an area will also change. A species may become less rare in an area or it may disappear completely. It is largely a matter of opinion whether a species is or is not considered rare. The authors base their decision in this regard on previous reports rather than on the distributions indicated by herbarium collections. It seems to me that there are additional species which might be classified as rare in Saskatchewan, for example, *Sorbus scopuliva* and *decora*.

Some plants may eventually b dropped from the list of rare plan because they become more abunda or widespread or because furth study shows that they are mo abundant than presently reporte Other species may be dropped fro the list for other reasons. For e ample, *Yucca glauca* is listed with o location east of Fox Valley. A he barium specimen from this locati was received in 1978. Recently w have been told that a *Yucca* pla brought in by a visitor from the Unite States was planted in that location 2 30 years ago. The plant has survive and reproduced and there are now dozen or more plants in that sand location. The species is indeed rare Saskatchewan but is it a nativ species?

The spots on the maps represe collections over a hundred-ye period. One wonders how many of th species listed as rare have alrea been extirpated from the provinc *Downingia laeta* is represented b one spot near Skull Creek where was collected in the nineteenth ce tury by Macoun. A conscious searc for the species in the same are showed that it was still present in th 1950s but will it still be there in th 1980s? What about other species *Carex assiniboinensis* is reported a occurring at Moose Jaw, Lumsde Lake Katepwa, and Roche Perce The first collection in Saskatchewa was in River Park in Moose Jaw 1936. Cities and towns i Saskatchewan are noted for the preservation of natural areas. Is the any *C. assiniboinensis* in Moose Ja at the present time? There must no as mentioned in the Preface, b verification of the specimens locate on the maps and there must be "fie

lue-eyed Grass — *Fred W. Lahrman*

erification of the current status of opulations and an assessment of hreats to the habitat of each pecies."

The notes on each species listed as are give references and short comments on range, habitat and status. or a few species there are also some omments on protection but usually ne laws protecting the species are pplicable only in certain American tates. In some cases there may also e laws restricting international trade. or the most part there is no egislation protecting native egetation in Saskatchewan.

The book is an excellent initial tudy of our native vascular plants. It to be hoped that knowledge of our are plants will become more complete and that the study can be extended to cover all biological diversity n the province. It is also hoped that more people will become interested in our native plants. How many of these rare vascular plants do you know? Obviously the authors are not urging readers to rush out to collect rare plants and the book does not give the exact location of any plant. The book does reflect an increasing appreciation of our natural heritage and an expanding interest and understanding will help in the development of effective conservation policies.

The Canadian Botanical Association and the National Museum of Natural Sciences are to be congratulated for initiating this study but the interest and support of naturalists are needed to complete the study and to give adequate protection to Saskatchewan's rare plants. — Reviewed by *George F. Ledingham*, 2335 Athol Street, Regina, Saskatchewan, S4T 3G4.

## BIRDS OF THE GAINSBOROUGH-LYLETON REGION (SASKATCHEWAN AND MANITOBA)

RICHARD W. KNAPTON. 1979. Saskatchewan Natural History Society Special Publication No. 10. Regina. 72 pp. $3.00.

This is the seventh regional bird report in the special publication series, and the first to cover an area not exclusively within the boundaries of Saskatchewan: extreme southeastern Saskatchewan and southwestern Manitoba. As such, it is an important addition to Saskatchewan's bird literature, but even more important to Manitoba, which has only one other comparable regional report (covering Churchill).

Although readily accessible to observers from southern prairie cities, this sparsely settled area has lacked ornithological work of significance. The present report is a "spin-off" of Knapton's Ph.D. work on Clay-colored Sparrows in the area. Introductory sections cover previous work, describe the area and bird work in surrounding areas, and define terms. Tables include Christmas counts from 1971 to 1978, species proved and suspected of breeding in the area, and occupancy of bluebird houses from 1970 to 1978. One map depicts localities within the study area and another shows it in relation to adjacent parts of the two provinces and North Dakota.

The bulk of the book consists of the species accounts. These, of course, emphasize records of occurrence and abundance, and chronological events, but also include some detail on behaviour and ecology. The late John Lane often emphasized the problem of House Sparrows at bluebird houses in southern Manitoba. Data here support Lane's concern, and indicate that House Sparrows may also be important aggressors to Cliff Swallow
Aggression between Tree Swallov
and Mountain Bluebirds competir
for a nestbox is also documente
Similar interesting notes are scatter
throughout the text.

In general, the book has bee
prepared well and is remarkably fre
of technical errors. Kestrel shou
read American Kestrel; the speci
name of the American Avocet is mi
printed "*maericana*"; and *Zenaidu*
has been merged in *Zenaida*. I wa
pleased to see recognizable rac
discussed as such, although the cor
moner race of the Dark-eyed Junco
not named, and the author does n
say whether races were distinguishe
for the White-crowned Sparrow.

I found the discussion somewh
lacking for some uncommon speci
or races. The Spotted race of th
Rufous-sided Towhee was caught in
mist net. This is documented, but wi
no comment that this is the rarer rac
in Manitoba. Reference is made
several uncommon species witho
mention of papers summarizing the
occurrence on the prairies: Red Kn
(summarized by McNicholl, *Blue Ja*
27:28-35, 1969), Norther
Mockingbird (Brazier, *Blue Jay* 22:6
75, 1964), Orchard Oriole (Hatc
*Blue Jay* 23:161-162, 1965), ar
Dickcissel (Sealy, *Blue Jay* 29:12-1
1971). These summary reports a
now out-dated and this is probab
not the place to up-date them, b
they should have been used
references to the general status
these species in the prairie province
In one case (Black-headed Grosbea
Knapton did update the record
elsewhere (*Blue Jay* 33:181, 1975
The discussion of problems of Gr
Partridge survival on the prairies
also incomplete without reference
the work of Westerskov (*Proc. Ne*
*Zealand Ecol. Soc.* 12:23-30, 1965)
Alberta. Somewhere Knapton shou
have pointed out that the "wi
turkeys" in the historical reference
the beginning of the book were like
Sandhill cranes.

lay-colored Sparrow — Gary W. Seib

These few criticisms are minor and o not detract from the overall high uality of the book. All serious orithologists and naturalists in the rairie provinces and adjacent states hould have a copy of this important ddition to the avifaunal literature of e Northern Great Plains. Knapton nd the Saskatchewan Natural istory Society are to be conratulated on an excellent piece of ork. — Reviewed by *Martin K. Mcicholl*, c/o Beak Consultants Ltd., 530 11A St. N.E., Calgary, Alberta, 2E 6M7.

## RIGHT WINGS OF UMMER

AVID G. MEASURES. 1976.
entice-Hall, Inc., Eaglewood Cliffs,
J. 160 pp. $12.95.

This is an ideal book for the novice, for the person just becoming interested in butterflies. It presents a fairly extensive, general background of butterflies without becoming too technically involved in scientific names, etc. For the experienced professional or amateur, it is an enjoyable book to read, bringing back memories and events as the author's and one's own experiences coincide. The book is filled with excerpts from his diaries, including field notes, delightful watercolors of butterflies in action, drawings and charts. The field notes, however, are somewhat illegible. There are also some very fine color photographs of live butterflies.

In Part One: "Beginnings", the author tells how, upon growing up in southern England, he discovered the natural world on his own. Today he is an artist, and he became interested in butterflies through their pleasing, colorful appearance.

*Melissa Blues* *Fred W. Lahrma*

The author gives an account of butterflies and their habits in Part Two. Among the topics covered are sites, butterfly identification, general behaviour, breeding, feeding, colonial and territorial habits, life history, and death and predation. I found this part of the book especially interesting; in remarkable detail, it describes courtship rituals, egg laying, hibernation, and other related butterfly phenomena. Most of the information is drawn from the author's own observations.

In the last section of the book, "You and Butterflies", the author describes how you can get to know butterflies in your own locality, making careful notes and observations. He shows which plants attract which species, as well as indicating with charts when to look for certain species.

This is a beautiful, well-written book, a must for every naturalist and eager butterfly fan.

I question, however, the author's view that specimens should not be collected, that it is even necessary t urge people to stop killing butterflies He maintains that butterfly collectin is a major menace to their populations. This may be true in som special cases, e.g., tropical areas where butterflies are extensivel collected for commercial purpose such as use in jewelry, or where, owing to habitat loss, a species ha become rare and should b protected. Generally, though collecting is done on a small scal and has no actual effect on th species. The real peril to butterflie lies in our increasing encroachmen on the land from intensifie agricultural practices, extensive us of pesticides and environmenta pollutants discharged from industria plants. All of these factors, especiall through the eradication of habitat, ar the real danger. Collecting, records and experimentation are necessary t get a better understanding of animal and their ecology. — Reviewed b *Brook Alder Nero*, 546 Coventr Road, Winnipeg, Manitoba, R3R 1B6

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